

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

**UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION**

Midas Green Technologies, LLC,

Plaintiff,

- vs. -

Rhodium Enterprises, Inc.;
Rhodium Technologies LLC;
Rhodium 10mw LLC;
Rhodium 2.0 LLC;
Rhodium 30mw LLC;
Rhodium Encore LLC;
Rhodium Renewables LLC;

Defendants.

Civil Action No. 6:22-cv-00050-ADA

Jury Trial Demanded

DR. JAMES LEE

REBUTTAL EXPERT REPORT REGARDING

VALIDITY OF U.S. PATENT NO. 10,405,457

January 26, 2024

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

TABLE OF CONTENTS

I. EXPERT INTRODUCTION	5
II. BACKGROUND AND QUALIFICATIONS	5
III. ASSIGNMENT	6
IV. MATERIALS CONSIDERED	7
V. BRIEF SUMMARY OF OPINIONS	7
VI. LEGAL GUIDELINES PROVIDED BY COUNSEL	11
A. Presumption Of Validity	11
B. Prior Art	11
C. Impact Of A Reference Being Considered By The Patent Office During Prosecution	12
D. Invention And Inventorship	13
E. Pre-AIA Application For Priority Dates	13
F. Level Of Ordinary Skill In The Art	14
G. Claim Interpretation	15
H. Anticipation Under 35 U.S.C. §102	15
I. Obviousness Under 35 U.S.C. §103	16
J. Motivation To Combine And Hindsight	17
K. Secondary Considerations	17
L. Written Description	18
M. Enablement	19
N. Acceptable Non-Infringing Alternatives	19
VII. IMMERSION COOLING GENERALLY	20
VIII. THE ASSERTED CLAIMS	22
IX. ALTERNATIVE PRIORITY DATES FOR THE ‘457 PATENT	23
A. Priority Date: March 14, 2012	23
B. Priority Date: December 14, 2012	34
C. Priority Date: June 7, 2013	38
D. Priority Date: December 13, 2013	40
E. Diligence Timeline	40
X. VALIDITY UNDER 35 U.S.C. §112	42
A. Disclosure Of The Plenum In The ‘457 Patent	42
B. Disclosure Of The Weir In The ‘457 Patent	44
XI. DISCUSSION OF PRIOR ART TO BE CONSIDERED	45
A. March 14, 2012, As The Priority Date	45

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

1. GRC GEN 1 Tank (The Best Tank).....	45
2. The Best ‘463 Patent	50
3. The Oktay ‘244 Patent	51
4. The JP ‘758 Patent	51
5. The Pfahnl Application	52
6. The Quon ‘108 Patent	53
7. The Rolfson ‘298 Patent	54
8. The Attlesey ‘419 Patent.....	54
B. December 13, 2012, As The Priority Date.....	55
1. The Best Publication	55
C. June 7, 2013, As The Priority Date.....	58
D. December 13, 2013, as the Priority Date	58
XII. ANALYSIS OF CLAIM 1 UNDER 35 U.S.C. § 102. (ANTICIPATION).....	59
A. GRC GEN 1 Tank	59
B. The Best ‘463 Patent	70
C. The Best ‘914 Patent	76
D. The Best Publication	77
E. The Oktay ‘244 Patent	85
F. The JP ‘758 Patent	91
G. The Pfahnl Publication	94
H. The Quon ‘108 Patent.....	97
I. The Rolfson ‘298 Patent	100
J. The Attlesey ‘419 Patent.....	103
XIII. ANALYSIS OF CLAIM 1 UNDER 35 USC § 103 (OBVIOUSNESS)	108
A. Single Reference Obviousness.....	108
B. GRC GEN 1 Tank	109
C. The ‘463 Patent (Best ‘463).....	109
D. The Best ‘914 Patent	110
E. The 2014 Best Publication	110
F. The Oktay ‘244 Patent.....	110
G. The JP ‘758 Patent	111
H. The Pfahnl Publication	111
I. The Quon ‘108 Patent.....	112
J. The Rolfson ‘298 Patent	112

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

K. The Attlesey ‘419 Patent.....	113
L. Combination of References.....	113
M. Not All Limitations Found	114
N. Non-Analogous Art.....	114
O. Motivation to Combine.....	118
P. Secondary Consideration	121
Q. Commercial Success	121
R. Copying by Others	123
S. Failure of Others.....	124
T. Teaching Away	125
XIV. ANALYSIS OF CLAIM 5 UNDER 35 U.S.C. § 102.	125
XV. RESERVATION OF RIGHTS	125

*CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER***I. EXPERT INTRODUCTION**

1. My name is James Lee, Ph.D. and I reside in Pittsford, New York. I am over the age of 18 and am competent to make this Rebuttal Expert Report regarding validity of the U.S. Patent No. 10,405,457 (the “Report”). I have personal knowledge, or have developed knowledge based upon education, training, or experience of the matters set forth herein.

2. I have been retained by Plaintiff Midas Green Technologies, LLC (“Midas”) in the above-captioned proceeding as an independent consultant to offer opinions and testimony to rebut the Invalidity Report of Alfonso Ortega, Ph.D. where he alleged the invalidity of claims 1 and 5 of U.S. Patent No. 10,405,457 (the “‘457 Patent” or “Patent-in-Suit”) attached hereto as Exhibit 2.

3. I understand that Dr. Ortega analyzed additional claims of the ‘457 Patent as well as claims in U.S. Patent No. 10,820,446 (the “‘466 Patent”). I understand that as part of a mandated court process for reducing the number of asserted claims, Midas withdrew all other claims from assertion and are now asserting only claims 1 and 5 of the ‘457 Patent (the “Asserted Claims”). Accordingly, I understand that Dr. Ortega will not be addressing the non-asserted claims at his deposition or at trial. As such, I only address the current Asserted Claims 1 and 5 of the ‘457 Patent in this Report.

II. BACKGROUND AND QUALIFICATIONS

4. I am a licensed Professional Engineer with a Ph.D. in Mechanical Engineering from Texas A&M University. Prior to obtaining my Ph.D., I received a Bachelor of Science in Aeronautical Engineering from California Polytechnic State University, San Luis Obispo.

5. My areas of expertise include fluid dynamics, heat transfer, mechanical system, and component design; energy systems involving engines and renewable energy.

6. Currently I am an Associate Professor at the Rochester Institute of Technology, located in Rochester, New York. I am the chair of the Electrical and Computer Engineering Technology Department. I currently perform research on internal combustion engine development, alternative energy systems development, and new technology assessment.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

7. Prior to my time at the Rochester Institute of Technology, I was a Senior Research Associate at General Motors where I designed and analyzed cooling systems for fuel cell systems. I was also the program manager responsible for developing materials and processes that enable high volume manufacturing of membrane electrode assemblies, the heart of a fuel cell. During my tenure at General Motors, I was awarded the Chairman's award for outstanding innovation in the automotive industry.

8. I have attached my complete and accurate Curriculum Vitae as Exhibit 1 to this Report.

III. ASSIGNMENT

9. I understand that Midas is alleging infringement of the '457 Patent against Defendants Rhodium Enterprises, Inc., Rhodium Technologies, LLC, Rhodium 10MW LLC, Rhodium 2.0 LLC, Rhodium 30MW LLC, Rhodium Encore LLC, and Rhodium Renewables LLC (collectively, "Rhodium") in the above captioned matter in the Western District of Texas.

10. I am being compensated for my services in this matter at my standard consulting rate of \$375 per hour. I am also being reimbursed for expenses that I incur during the course of this work. My compensation is not contingent upon the results of my study, the substance of my opinions, or the outcome of any proceeding involving the '457 Patent and the Asserted Claims. I have no financial interest in the outcome of this matter.

11. I am prepared to testify as an expert witness for deposition and at trial in this matter if called to do so.

12. The patent at issue is U.S. Patent Number 10,405,457 (the "'457 Patent") issued September 3, 2019. The '457 Patent is assigned to Midas Green Technologies, LLC. The title of the '457 Patent is "Appliance Immersion Cooling System." At a high level, the '457 Patent is directed to a system for improved cooling of electronic devices, such as computer servers and other computing equipment. More particularly, the system of the '457 Patent immerses electronic appliances in a tank of dielectric fluid (in this case, a dielectric liquid). Dielectric fluid is nonconductive, so it is safe for electronics, and has desirable thermodynamic characteristics,

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

such that it is able to more efficiently extract heat from electronic devices as compared to air-cooling. The system of the '457 Patent circulates the dielectric fluid in the tank, and in particular, dispenses the fluid into the tank from a plenum adjacent the bottom of the tank, which uniformly directs the fluid upward through the electronic appliances. The heated fluid flows out of the cooling tank over a weir, and the fluid is received into a recovery reservoir. Heat extracted from the electronic appliances is dissipated to the environment using a cooler, such as an evaporative cooler.

IV. MATERIALS CONSIDERED

13. The materials I have considered in rendering my opinions are listed in Exhibit 3 and all materials cited in this Report and in the analysis for Expert 4.

V. BRIEF SUMMARY OF OPINIONS

14. As set forth in detail in this Report, it is my opinion that each of the Asserted Claims 1 and 5 of the '457 Patent are valid.

15. My opinions are based on my years of education, research, and experience, as well as my investigation and study of relevant materials, including those identified in this Report.

16. I may rely upon these materials, my knowledge and experience, and/or additional materials in forming any other necessary opinions. Further, I may also consider additional documents and information to rebut Dr. Ortega's opinions. I reserve any right that I may have to supplement this Report if further information becomes available or if I am asked to consider additional information. Furthermore, I reserve any right that I may have to consider and comment on any additional expert opinions or testimony of Rhodium's expert witnesses in this matter.

17. I have been asked by counsel to evaluate whether or not the following materials or references of prior art anticipate claims 1 or 5 of the '457 Patent:

- The Green Revolution Cooling Tank (the "GRC GEN 1 Tank")¹
- U.S. Patent No. 10,123,463 ("Best '463 Patent")

¹ Dr. Ortega refers to this tank as the "Best Tank" which is a disputed fact.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

- U.S. Patent No. 9,992,914 (“Best ‘914 Patent”)
- U.S. Patent Application Publication No. 2014/0211412 (“2014 Best Publication”)
- U.S. Patent No. 3,406,244 (“Oktay ‘244 Patent”)
- Japanese Patent No. JPH04116758 (“JP ‘758 Patent”)
- U.S. Patent Application Publication No. 2006/0126292 (“Pfahnl Publication”)
- U.S. Patent No. 5,448,108 (“Quon ‘108 Patent”)
- U.S. Patent No. 6,555,298 (“Rolfson ‘298 Patent”)
- U.S. Patent No. 8,009,419 (“Attlesey ‘419 Patent”)

18. As to anticipation pursuant to 35 U.S.C. § 102, it is my opinion that:

- The GRC GEN 1 Tank does not anticipate claims 1 or 5 of the ‘457 Patent;
- The Best ‘463 Patent does not anticipate claims 1 or 5 of the ‘457 Patent;
- The Best ‘914 Patent does not anticipate claims 1 or 5 of the ‘457 Patent;
- The 2014 Best Publication does not anticipate claims 1 or 5 of the ‘457 Patent;
- The Oktay ‘244 Patent does not anticipate claims 1 or 5 of the ‘457 Patent;
- The JP ‘758 Patent does not anticipate claims 1 or 5 of the ‘457 Patent;
- The Pfahnl Publication does not anticipate claims 1 or 5 of the ‘457 Patent;
- The Quon ‘108 Patent does not anticipate claims 1 or 5 of the ‘457 Patent;
- The Rolfson ‘298 Patent does not anticipate claims 1 or 5 of the ‘457 Patent; and
- The Attlesey ‘419 Patent does not anticipate claims 1 or 5 of the ‘457 Patent.

19. I have been asked by counsel to evaluate whether or not the following materials or references of prior art are obvious to claims 1 or 5 of the ‘457 Patent:

- The Green Revolution Cooling Tank (the “GRC GEN 1 Tank”)²
- U.S. Patent No. 10,123,463 (“Best ‘463 Patent”)
- U.S. Patent No. 9,992,914 (“Best ‘914 Patent”)
- U.S. Patent Application Publication No. 2014/0211412 (“2014 Best Publication”)
- U.S. Patent No. 3,406,244 (“Oktay ‘244 Patent”)

² Dr. Ortega refers to this tank as the “Best Tank” which is a disputed fact.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

- Japanese Patent No. JPH04116758 (“JP ‘758 Patent”)
- U.S. Patent Application Publication No. 2006/0126292 (“Pfahnl Publication”)
- U.S. Patent No. 5,448,108 (“Quon ‘108 Patent”)
- U.S. Patent No. 6,555,298 (“Rolfson ‘298 Patent”)
- U.S. Patent No. 8,009,419 (“Attlesey ‘419 Patent”)

20. As to obviousness pursuant to 35 U.S.C. § 103, it is my opinion that:

- The GRC GEN 1 Tank, alone or in combination with one or more other Cited References, does not render obvious to claims 1 or 5 of the ‘457 Patent;
- The Best ‘463 Patent, alone or in combination with one or more other Cited References, does not render obvious to claims 1 or 5 of the ‘457 Patent;
- The Best ‘914 Patent, alone or in combination with one or more other Cited References, does not render obvious to claims 1 or 5 of the ‘457 Patent;
- The 2014 Best Publication, alone or combination with one or more other Cited References, does not render obvious to claims 1 or 5 of the ‘457 Patent;
- The Oktay ‘244 Patent, alone or in combination with one or more other Cited References, does not render obvious to claims 1 or 5 of the ‘457 Patent;
- The JP ‘758 Patent, alone or in combination with one or more other Cited References, does not render obvious to claims 1 or 5 of the ‘457 Patent;
- The Pfahnl Publication, alone or in combination with one or more other Cited References, does not render obvious to claims 1 or 5 of the ‘457 Patent;
- The Quon ‘108 Patent, alone or in combination with one or more other Cited References, does not render obvious to claims 1 or 5 of the ‘457 Patent;
- The Rolfson ‘298 Patent, alone or in combination with one or more other Cited References, does not render obvious to claims 1 or 5 of the ‘457 Patent;
- The Attlesey ‘419 Patent, alone or in combination with one or more other Cited References, does not render obvious to claims 1 or 5 of the ‘457 Patent.

21. As to 35 U.S.C. § 112, Dr. Ortega had no ultimate opinion on written description,

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

and only made general comments regarding the Asserted Patent's disclosures of the plenum and weir. As a result, I was not asked to offer an opinion on the ultimate question of written opinion, but, as to the Asserted Patent, it is my opinion that the '457 Patent fully discloses the plenum and weir to show the inventor was in possession of the claimed subject matter.

22. As to 35 U.S.C. § 112, Dr. Ortega had no ultimate opinion on enablement, and only made general comments regarding the Asserted Patent's disclosures of the plenum and weir. As a result, I was not asked to offer an opinion on the ultimate question of enablement, but, as to the Asserted Patent, it is my opinion that the '457 Patent fully discloses the plenum and weir to allow one skilled in the art to achieve the claimed invention without undue experimentation.

23. It is my opinion that Mr. Christopher Boyd conceived the inventions of claims 1 and 5 of the '457 Patent no later than March 12, 2012, and that the invention was corroborated by Mr. James Koen on March 14, 2012. Midas worked diligently to reduce Mr. Boyd's invention to practice at least by: (1) getting a quote to build the immersion system; (2) hiring a patent attorney; (3) engaging the engineering firm, Deaton, to finalize and implement design specifics; (4) filing a first provisional application; (5) building a tank; (6) filing a second provisional application; (7) filing a full utility patent; and (8) manufacturing and installing an operational immersion system. Specific dates and citations of this diligence are provided later in this Report.

24. It is my opinion that the invention of claims 1 and 5 of the '457 Patent are fully supported by U.S. Provisional Application No. 61/737,200 that Midas filed on December 14, 2012, to which the '457 Patent claims priority. As such, the December 14, 2012, Provisional Application was a constructive reduction to practice of Mr. Boyd's invention.

25. It is my opinion that the invention of claims 1 and 5 of the '457 Patent are fully supported by U.S. Provisional Application Nos. 61/737,200 and 61/832,211 that were filed respectively on December 14, 2012, and June 7, 2013, to which the '457 Patent claims priority. As such, the June 7, 2013, Provisional Application was a constructive reduction to practice of Mr. Boyd's invention.

26. It is my opinion that the invention of claims 1 and 5 of the '457 Patent are fully

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

supported by the U.S. Utility Patent Application No. 14/355,533, PCT, with a filing date of December 13, 2013, from which the ‘457 Patent ultimately issued. As such, the December 13, 2013, Utility Application was a constructive reduction to practice of Mr. Boyd’s invention.

VI. LEGAL GUIDELINES PROVIDED BY COUNSEL

27. I am not a legal expert, and I offer no opinions on the law. However, I have been informed by counsel of the applicable legal standards with respect to patent validity, and I have applied them in arriving at my opinions in this case.

A. Presumption Of Validity

28. I have been informed by counsel that a patent is presumed valid as it has been granted by the United States Patent and Trademark Office (“USPTO”). I have also been informed that the party challenging validity must present clear and convincing evidence in order to overcome this presumption. It is my understanding that the “clear and convincing evidence” standard is an intermediate standard which lies between “beyond a reasonable doubt” (used in criminal cases) and a “preponderance of the evidence” (the standard for infringement). I understand that, although not susceptible to a precise definition, the Federal Circuit has described clear and convincing evidence as that which produces in the mind an abiding conviction that the truth of the factual contentions is highly probable. In reaching my opinions, I have applied this standard. I also understand that the validity of each claim is determined independently of the validity of any other claims, including those upon which it may depend.

29. I understand that a challenger can establish that a patent claim is invalid only by presenting clear and convincing evidence that every limitation in the claim and every limitation in any claims on which it depends, if any, was not novel or was obvious at the time of invention. In other words, an asserted claim cannot be established as invalid if even a single one of the limitations in the claim can be shown not to be obvious, present in, or taught by any prior art.

B. Prior Art

30. I understand that a “prior art reference” is a device, method, patent, or publication which predates the claimed invention of a patent and discloses elements of a claim. I understand

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

that the disclosure in the prior art reference does not have to be in the same words as the claim, but the requirements of the claim must be present, either stated or necessarily implied, so that a “person of ordinary skill in the art” (“POSITA”) would be able to use the prior art reference to make and practice at least one embodiment of the claimed invention.

31. I understand that a patent may be invalid if a claim failed to meet one of several statutory provisions in the patent laws. I understand that these provisions are sometimes referred to as “statutory bars.” I further understand that for a patent claim to be invalid because of a statutory bar, the prior art reference must be dated (1) before the date of invention or (2) more than one year before public use or sale of the invention or the filing date of the patent application.

32. I understand that a prior art reference may invalidate a patent if the prior art shows that the claimed invention was already patented or described in a printed publication anywhere in the world more than one year before the effective filing date of the patent application. I understand that a prior art reference is a “printed publication” if it is reasonably accessible to those with interest in the field, even if it is difficult to find. I further understand that a printed publication includes an electronic publication, such as an on-line or Internet publication.

33. I also understand that a prior art reference may invalidate a patent if the prior art shows that the claimed invention was already being publicly or commercially used in the United States more than one year before the effective filing date of the patent application, and that use was not primarily an experimental use controlled by the inventor to test whether the invention worked for its intended purpose.

C. Impact Of A Reference Being Considered By The Patent Office During Prosecution

34. I understand that when a prior art reference was considered by the USPTO during patent prosecution, the party attempting to use that prior art reference to argue invalidity shoulders an enhanced burden. Although the standard of proof does not depart from the clear and convincing standard, the presumption is that the USPTO did consider that prior art and rejected

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

such an argument regarding invalidity in granting the patent.³

35. It is my understanding that the following references used by Dr. Ortega in his report are subject to an enhanced burden, as each was considered by the USPTO during prosecution of the application that issued as the '457 Patent:

- The Best '463 Patent, as the Examiner considered Best 2011/0132579 (the "2011 Best Publication") and allowed the '457 Patent over it;
- The Best '914 Patent is a continuation of the '463 Patent, and therefore has the same disclosures as in the 2011 Best Publication;
- The Pfahnl Publication was considered by the Examiner, and allowed the '457 Patent over it; and
- The Attlesey '419 Patent was considered by the Examiner and allowed the '457 Patent over it.

D. Invention And Inventorship

36. I understand that because a patent is presumed valid, the named inventors on the patent are presumed to be the true inventors. "Conception is the touchstone of inventorship, the completion of the mental part of invention. It is 'the formation in the mind of the inventor, of a definite and permanent idea of the complete and operative invention, as it is hereafter to be applied in practice.'" Because conception is a mental act, there must be corroborating evidence of a "contemporaneous disclosure that would enable one skilled in the art to make the invention."⁴

E. Pre-AIA Application For Priority Dates

37. I understand that the changes to 35 U.S.C. §102 and §103 in the AIA do not apply to any application filed *before* March 16, 2013. Thus, any application filed before March 16, 2013, is governed by Pre-AIA 35 U.S.C. §102 and §103. In this case, the first provisional application that the '457 Patent claims priority was filed December 14, 2012. As this date

³ While "the standard of proof does not depart from that of clear and convincing evidence, a party challenging validity shoulders an enhanced burden if the invalidity argument relies on the same prior art considered during examination by the [USPTO]." *Tokai Corp. v. Easton Enters., Inc.*, 632 F.3d 1358, 1367 (Fed. Cir. 2011).

⁴ *Burrows Wellcome Co. v. Barr Labs*, 40 F.3d 1223, 1227-1228 (1994)

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

precedes March 16, 2013, the Pre-AIA 35 U.S.C. §102 and §103 standards govern this case.

38. As a result, Mr. Boyd, the sole inventor of the ‘457 Patent, can swear behind the U.S. Patent Application Publication No. 2014/0211412 (“2014 Best Publication”) which has a PCT filing date of August 4, 2012. Although the 2014 Best Publication refers to a provisional application filed August 5, 2011, as discussed more fully below, that provisional application has no support for the portions of the 2014 Best Publication that Dr. Ortega relies upon. As such, the 2014 Best Publication is only available as a prior art reference after August 4, 2012.

39. It is my understanding that Mr. Boyd has proof of conception and corroboration for the Asserted Claims as of March 14, 2012. As a result, it is my understanding that Mr. Boyd, as the sole inventor, can swear behind the Best Publication, which has a PCT filing date of August 4, 2012, thereby removing the 2014 Best Publication as a prior art reference.

F. Level Of Ordinary Skill In The Art

40. I understand that claims are viewed from the perspective of a person of ordinary skill in the art (POSITA). I understand that a POSITA is a hypothetical person who is presumed to have known the relevant art at the time of the invention. Factors that may be considered in determining the level of ordinary skill in the art may include: (1) type of problems encountered in the art; (2) prior art solutions to those problems; (3) rapidity with which innovations are made; (4) sophistication of the technology; and (5) educational level of active workers in the field, including the inventors. I have also been informed that in some cases, every factor may not be accounted for, and the factors may have various weights applied to them.

41. Taking these factors into consideration, it is my opinion that a POSITA at the time of the earliest possible priority date of the Patent-In-Suit would have been an individual with a bachelor’s degree in science or engineering with at least three years’ experience working in a field that involves the operating or maintaining computers in data centers or other environments having large numbers of heat-generating electrical appliances. Additional education could compensate for less practical experience and vice versa.

42. I understand Dr. Ortega took the position that in the context of the Patent-in-Suit,

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

a POSITA would be “In my opinion, as of the time of the purported invention, a POSA in the field of the Asserted Patents would have had a working knowledge of immersion cooling systems. The POSA would have either (1) a bachelor’s degree in mechanical engineering, or an equivalent degree, and five years of professional experience, including with responsibility for designing immersion cooling systems or (2) a master’s degree in mechanical engineering, or an equivalent degree, including study in liquid cooling systems design and research. Lack of professional experience can be remedied by additional education, and vice-versa.”

43. I do not agree with Dr. Ortega’s definition of POSITA. Still, my opinions are the same regardless of both of these definitions.

G. Claim Interpretation

44. On July 11, 2022, the Parties filed a “Joint Stipulation of Claim Construction” with the Court, which I have been informed has been adopted by the Parties and the Court as the only and complete claim construction for this litigation. The following two terms are the only two terms for which a claim construction was stipulated:

- “Weir” has an agreed construction of “*an overflow structure or barrier that determines the level of liquid.*”
- “Plenum” has an agreed construction of “*a structure for dispensing liquid.*”

45. I have applied the above claim constructions in my analysis.

46. It is my understanding that the remaining claim terms are to be given their plain and ordinary meaning to a POSITA. That is the meaning that I have applied to all remaining claim limitations in my analysis.

47. I reserve the right to opine on claim construction, or the invalidity of the asserted claims under an alternate claim construction if, for example, Defendant offers opinions regarding an alternate claim construction or an alternate interpretation of the plain and ordinary meaning of a particular claim term.

H. Anticipation Under 35 U.S.C. §102

48. I understand that a prior art reference anticipates a patent claim if the challenger is

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

able to establish by “clear and convincing evidence” that a single reference discloses all limitations of that claim, either expressly or inherently. I understand that, in order for a prior art reference to anticipate a patent claim, the descriptions in that reference and the words in the claim need not be identical so long as all of the limitations of the claim are present in a single reference. Moreover, I understand that a prior art reference need not explicitly describe each limitation of the claimed invention in order to anticipate if the limitations are necessarily implied in the reference such that a POSITA, after looking at the reference, would be able to make and use the claimed invention.

I. Obviousness Under 35 U.S.C. §103

49. I understand that an asserted claim that is not anticipated is still invalid if the challenger is able to establish by clear and convincing evidence that, at the time of the alleged invention, the subject matter of the claim would have been obvious to one of ordinary skill in the art in light of the teachings of the prior art. Obviousness often involves combining more than one prior art reference. I understand that the following factors must be evaluated to determine whether an asserted claim is obvious:

- the scope and content of the prior art.
- the difference or differences, if any, between each asserted claim and the prior art.
- the level of ordinary skill in the art at the time the invention was made; and
- additional secondary considerations, if any, that indicate that the invention was not obvious.

50. I understand that it would be improper to base an obviousness determination on a “hindsight” analysis, i.e., to use the teachings of the patent as a roadmap to combine prior art references or otherwise to find a claim obvious. Instead, a challenger must have placed himself or herself back to the time of the purported invention and been guided by the prior art references and the then-existing knowledge, skill, and creativity of a POSITA.

51. I understand that, to support the conclusion that the claimed invention is directed

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention. I understand that rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness. I understand that if the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims obvious. I understand that if a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification.

J. Motivation To Combine And Hindsight

52. I understand that to prove a claim would have been obvious, the accused infringer must demonstrate that a POSITA would have been motivated to combine or modify the prior art to achieve the claimed invention and would have had a reasonable expectation of successfully combining or modifying the prior art. I understand that the suggestion to modify or combine relevant prior art references may come from either:

- A teaching or suggestion in the prior art references.
- The common sense of a POSITA.
- Any need or problem known to a POSITA and addressed by the claimed invention, including, but not limited to, the problem addressed by the patent; or
- Design incentives and other market forces.

53. I further understand that obviousness should not be evaluated using the benefit of hindsight or what is known today.

K. Secondary Considerations

54. I understand that when evaluating the issue of obviousness, it is necessary to consider certain additional factors which, if established, may indicate that the invention would not have been obvious. No factor alone is dispositive. These factors, sometimes called “secondary considerations,” include the following:

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

- Were the products covered by the claim successful because of the merits of the claimed invention or because of other reasons, such as advertising or other features of the product other than those found in the claims?
- Was there a long felt need for a solution?
- Did others try and fail to solve the same problem as the inventor?
- Did others copy the claimed invention?
- Did the claimed invention achieve unexpectedly superior results over the closest prior art?
- Did others in the field praise the claimed invention or express surprise at the making of the claimed invention?
- Did others accept licenses under the patent because of the merits of the claimed invention?
- Was the claimed invention developed independently by other persons, either before it was invented by the patentee or at about the same time?

L. Written Description

55. I understand that a patent claim is invalid if the patent does not contain an adequate written description of the claimed invention. The test for written description is whether the specification would have objectively demonstrated to a POSITA that the patent applicant actually invented, or “possessed,” the claimed subject matter when the patent application was filed. The written description requirement does not require disclosure of examples or an actual reduction to practice of the claimed invention. However, the specification must show possession of the invention on its face, and evidence of reduction to practice outside of the specification is not sufficient by itself to satisfy the written description requirement.

56. I understand the written description requirement does not require the patent to describe exactly the subject matter claimed. I understand the written description requirement must allow persons of ordinary skill in the art to recognize the claimed invention. I understand that the written description requirement does not require the claims to recite the exact terms used

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

in the specification.

M. Enablement

57. I understand that a patent claim is invalid if the specification does not teach a POSITA how to make and use the full scope of the claimed invention without undue experimentation. Enablement is determined from the point of view of a POSITA at the time when the patent application was filed. I further understand that the following factors may be considered to determine whether any experimentation would have been undue:

- The quantity of experimentation necessary;
- The amount of direction or guidance presented;
- The presence or absence of working examples;
- The nature of the claimed invention;
- The state of the prior art;
- The relative skill of those in the art;
- The predictability or unpredictability of the art; and
- The breadth of the claims.

N. Acceptable Non-Infringing Alternatives

58. I have been instructed that the existence and availability of hypothetical or real acceptable non-infringing alternatives to the accused products can be relevant to determining damages from patent infringement. I understand that an alternative is “non-infringing” if its use does not meet each and every limitation of the asserted claims.

59. I also understand that, while a non-infringing alternative must have been “available,” that does not mean the alternative must have actually been on the market. I understand that availability of a non-infringing alternative is assessed at the time of first infringement and is based on a number of factors, including: (1) did the accused infringer possess the necessary equipment, knowledge, and experience to implement the alleged alternative; (2) how long would it have taken to develop or implement the alleged alternative, and how much would that development or implementation have cost; (3) were the effects of changing from the

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

infringing product or process to the alleged non-infringing alternative well-known or readily available at the time of first infringement; and (4) were the necessary materials or resources to develop or implement the non-infringing alternative available at the time of first infringement. I understand that a non-infringing alternative is an alternative product or method that does not infringe the claims of the Asserted Patents. Further, I understand that a non-infringing alternative must be available and commercially acceptable.

60. I further understand that there are several considerations that may be relevant to whether or not a proposed non-infringing alternative was commercially acceptable in the marketplace. I understand that these considerations include:

- The realities of the marketplace;
- If the accused infringer actually selected the accused infringing product or process instead of the alleged available, acceptable alternative;
- Any increase in cost for the alleged non-infringing substitute;
- If the characteristics of the alleged non-infringing alternative differ substantially from the patented process or product;
- How mature the alleged alternative technology is;
- If purchasers or users are motivated to select the accused product or process because of the particular infringing features not found in the alleged non-infringing alternative; and
- The cost or difficulty of implementing the alleged non-infringing alternative.

61. I understand that the simple existence of a competing, non-infringing product or process, does not mean that a non-infringing product or process is an acceptable non-infringing alternative, especially if the competing product or process lacks the advantages of the patented product or process, and those advantages would have been important to users, or the lack of the infringing features would have been unacceptable to users.

VII. IMMERSION COOLING GENERALLY



62. I understand that Rhodium has claimed that the benefits of immersion cooling are






CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

paramount to Rhodium’s success as a bitcoin miner. For example, in an investor presentation, Chase Blackmon, CEO, stated Rhodium’s bitcoin mine “is already the most efficient data center in Texas, maybe even the whole U.S. with an incredible PUE⁵ of 1.05.” Below is a depiction of the benefits of immersion cooling cited by Rhodium in an investor presentation.

Proprietary Liquid-Cooling Technology

Founders Experienced in Liquid Cooling Technology

-  Miners submerged in dielectric fluid
-  Creates controlled environment
-  Minimizes temperature fluctuations
-  Prevents miner downtime
-  Decreases miner degradation

Key Advantages of Liquid-Cooling

- ✓ Improved Efficiency
- ✓ Extended Machine Life
- ✓ Geographic Flexibility
- ✓ Greater Control and Heat Regulation
- ✓ Greater Compute Density

63. Rhodium stated in its S-1 SEC filing that Rhodium’s liquid-cooling technology has many advantages over traditional air-cooled systems. “Rhodium’s technology allows Rhodium to submerge our bitcoin miners in cooling fluid, allowing Rhodium to optimize the hash rate, or processing power, of Rhodium’s miners relative to air-cooled systems, which allows us to predictably and consistently mine more bitcoin with fewer miners. Our liquid-cooling technology protects Rhodium equipment from high temperatures, humidity, dust, and vibration, all of which can lead to equipment damage and failure. Rhodium believes its mining computers

⁵ Power usage effectiveness (PUE) is a ratio that describes how efficiently a computer cooling system uses energy; specifically, how much energy is used by the computing equipment (in contrast to cooling and other overhead that supports the equipment).

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

have a 30% to 50% longer life than standard air-cooled machines.⁶

64. Further, immersion cooling allows Rhodium to “overclock” Rhodium’s miners at a rate upwards of 25%. This means Rhodium has the opportunity to increase its top line revenue, through a greater hash rate, without relying solely on purchasing additional miners. Overclocking is not available in an air-cooled mining environment.

65. “Air-cooled Mining” is not an acceptable substitute in the state of Texas because of the summer heat. According to Mr. Blackmon, “it is too hot to effectively air mine in Texas.”⁷

VIII. THE ASSERTED CLAIMS

66. The patent at issue is U.S. Patent Number 10,405,457 (“‘457 Patent”) issued September 3, 2019, to Midas Green Technologies, LLC. The title of the ‘457 Patent is “Appliance Immersion Cooling System.”

67. The Asserted Claims involving the Defendants’ alleged infringement of the ‘457 Patent are independent Claim 1 and dependent Claim 5.

68. Claim 1 reads:

1. *An appliance immersion cooling system comprising:*

a tank adapted to immerse in a dielectric fluid a plurality of electrical appliances, each in a respective appliance slot distributed vertically along, and extending transverse to, a long wall of the tank, the tank comprising:

a weir, integrated horizontally into the long wall of the tank adjacent all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot; and

a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip of the weir and adapted to receive the dielectric fluid as it flows over the weir.

a primary circulation facility adapted to circulate the dielectric fluid through the tank, comprising:

⁶ Amendment No. 4 to Form S-1 REGISTRATION STATEMENT UNDER THE SECURITIES ACT OF 1933, filed with the Securities Exchange Commission December 14, 2021.

⁷ B_Riley-000176-182

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

a plenum, positioned adjacent the bottom of the tank, adapted to dispense the dielectric fluid substantially uniformly upwardly through each appliance slot.

a secondary fluid circulation facility adapted to extract heat from the dielectric fluid circulating in the primary circulation facility, and to dissipate to the environment the heat so extracted; and

a control facility adapted to coordinate the operation of the primary and secondary fluid circulation facilities as a function of the temperature of the dielectric fluid in the tank.

69. Claim 5 reads:

5. *The system of claim 1 wherein the control facility further comprises a communication facility adapted to facilitate monitoring and control of the control facility from a remote location.*

IX. ALTERNATIVE PRIORITY DATES FOR THE ‘457 PATENT

A. Priority Date: March 14, 2012

70. It is my understanding that Mr. Boyd maintained an inventor’s notebook at the relevant times. It is also my understanding that his inventor’s notebook is in the form of a bound and numbered book, and has areas for keeping notes, and an area for signing and dating by both the inventor and a witness that understands the disclosure. I also understand Mr. Boyd maintained his inventor’s notebook in the regular course of his employment with Midas.

71. Mr. Boyd signed page five “3-21-2012”, however it is my understanding that Mr. Boyd is prone to dyslexia, and he intended to write “3-12-2012.” Both Mr. Boyd and Mr. Koen testified that Page 5 of the inventor’s notebook was actually signed on March 12, 2012, and is consistent in that the Page 4 of Mr. Boyd’s inventor notebook documents the date of “3-12-2012” and Page 3 is also dated and signed on 3-12-2012.

72. Page 5 of Mr. Boyd’s inventor notebook is “witnessed and understood” by Mr. Koen on March 14, 2012. I understand that Mr. Koen worked closely with Mr. Boyd at this time and was technically proficient at understanding and corroborating Mr. Boyd’s invention, and that

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

Mr. Koen would be considered one skilled in the art.

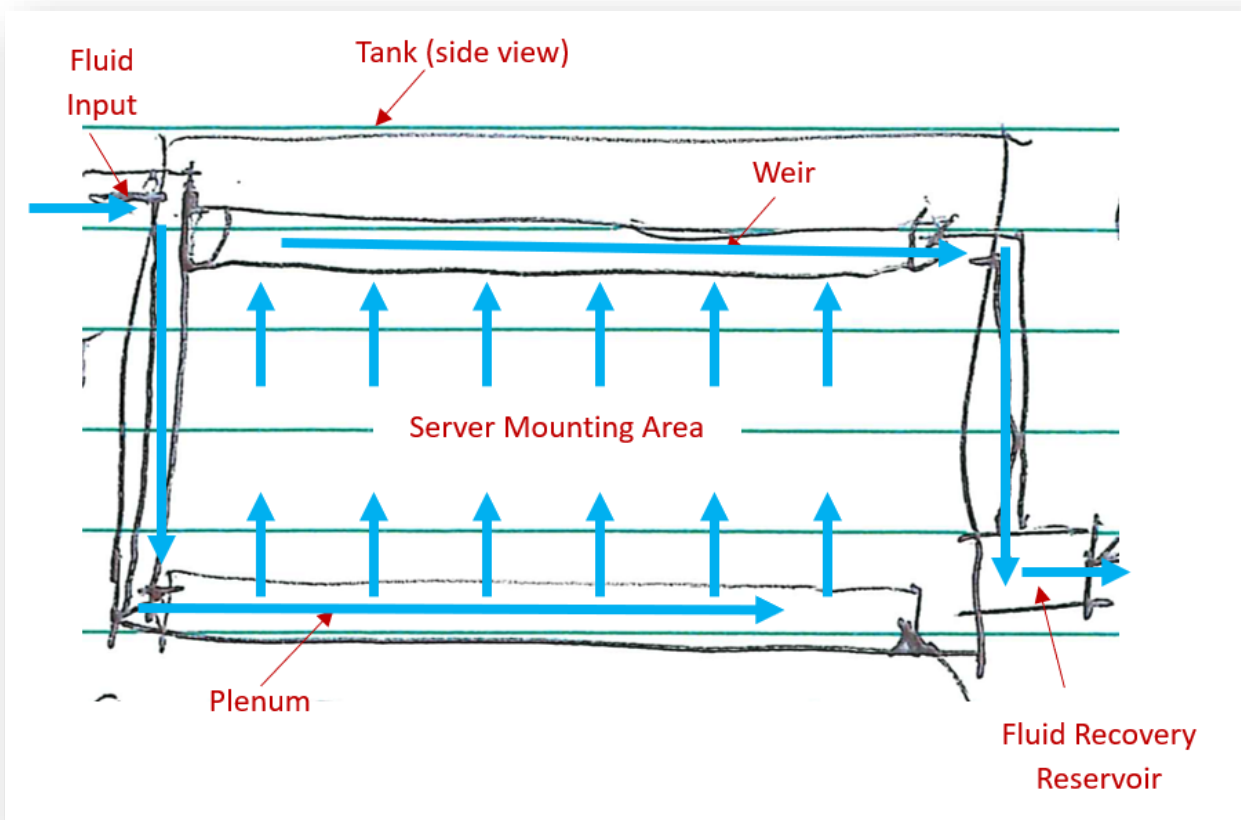
73. It is my opinion that Page 5 of Mr. Boyd's inventor's notebook shows that Mr. Boyd, as of March 12, 2012, had a definite and permanent idea of the complete and operative invention as set out in the Asserted Claims. It is also my opinion that Page 5 is a sufficient contemporaneous disclosure that would enable one skilled in the art to make the invention of the Asserted Claims, which was corroborated by Mr. Koen on March 14, 2012.

74. Below, I discuss each limitation of claim 1, and express my opinion that Mr. Boyd invented each respective limitation no later than March 12, 2012, which was corroborated by Mr. Koen on March 14, 2012. The words or phrases capitalized and in RED are labels I added to Page 5 of the inventor's notebook to facilitate my descriptions. My annotated Page 5 is shown on the next page. On the subsequent page is an enlargement of the top diagram from page 5 for improved clarity. For the enlargement I have highlighted Mr. Boyd's handwritten labels by adding my annotations in RED. The BLUE arrows indicate the general fluid path of the dielectric fluid. Page 5 of Mr. Boyd's inventor notebook is duplicated below:

CONFIDENTIAL - PURSUANT TO PROTECTIVE ORDER

Title			
<div style="text-align: center;"> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> </div>	<p>TITLE <u>FORCED CONVECTION TANK COOLING</u></p> <p>From Page No. <u>1</u></p>	<p>Project No. _____</p> <p>Book No. _____</p>	<p>5</p>
<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>Coolant Input Tube</p> </div> <div style="text-align: center;"> <p>Tank (side view)</p> </div> <div style="text-align: center;"> <p>U-Shaped Drain Tubes (Weir)</p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 10px;"> <p>Sump Container (Reservoir)</p> <p>Manifold (Plenum)</p> </div>			
<p>Goal</p>	<p>GOAL - IMPROVE FORCED CONVECTION COOLING EFFICIENCY BY AVOIDING MIXING OF COOLANT.</p> <p>COLD FLUID FLOWS INTO TANK VIA TUBE CONNECTED TO A SLOTTED MANIFOLD. COLD FLUID DISPLACES WARM FROM BELOW. WARM FLUID OVERFLOWS U-SHAPED DRAINS ON BOTH SIDES OF TANK WALL.</p>		
<p>Note 1</p>	<p>(NOTE - A SPINE ON THE SIDE OF THE U-TUBE COULD ACT AS A CONVENIENT MOUNT POINT FOR SERVER EARS.)</p> <div style="display: flex; align-items: center;"> <p style="margin-left: 10px;">U-TUBE PROFILE</p> </div>		
<p>Note 3</p>	<p>U-TUBES DRAIN INTO A CLOSED SUMP CONTAINER FOR RECIRCULATION THRU HEAT EXCHANGER. NOTE THAT THE PUMP CANNOT DRAIN THE TANK.</p>		
<p>POSSIBLE SLOTTED OUTFLOW MANIFOLD PROFILE</p> <div style="display: flex; align-items: center;"> </div>			
<p>Note 4</p>	<p>I SUSPECT SLOTS WOULD NEED TO BE NARROW ON THE END CLOSEST TO THE POINT WHERE COOLANT IS INJECTED, AND GET PROGRESSIVELY WIDER TO ACCOUNT FOR PRESSURE GETTING LOWER AS COOLANT FLOWS DOWN THE TUBE.</p> <p>(COULD ALSO USE A SERIES OF PROGRESSIVELY LARGER ROUND HOLES.)</p>		
<p>To Page No. _____</p>			
<p>Witnessed & Understood by me,</p> <p><i>[Signature]</i></p>	<p>Date</p> <p>3-14-12</p>	<p>Invented by:</p> <p>Chris Boyd</p> <p>Recorded by:</p> <p>Chris Boyd</p>	<p>Date</p> <p>3-2-2012</p>

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER



CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

75. Claim 1 of the '457 Patent is:

a. An appliance immersion cooling system.

76. Near the top of Page 5 of Mr. Boyd's inventor's notebook is a diagram showing a side view of an immersion cooling tank.

77. Mr. Boyd shows a TANK having a COOLANT INPUT TUBE that has U-SHAPED DRAIN TUBES for removing heated fluid. Page 5 also has a TITLE of "Forced Convection Immersion Cooling". Mr. Boyd also states that the GOAL of the invention is: "Improve forced convection cooling efficiency by avoiding mixing of coolant". It is my opinion that Mr. Boyd invented this limitation no later than March 12, 2012, and Mr. Koen corroborated it on March 14, 2012.

b. a tank adapted to immerse in a dielectric fluid a plurality of electrical appliances, each in a respective appliance slot distributed vertically along, and extending transverse to, a long wall of the tank.

78. Mr. Boyd shows a TANK having a COOLANT INPUT TUBE that has U-SHAPED DRAIN TUBES for removing heated fluid. Page 5 is also labeled "Forced Convection Immersion Cooling". Mr. Boyd also states that "a SPINE on the side of the U-TUBE could act as a convenient mount point for server ears" (NOTE 1). This shows that Mr. Boyd would mount computer servers in the tank vertically in a way that would immerse each server (note the mounting spine is drawn below the low side or overflow lip of the U-TUBES). It is my opinion that Mr. Boyd invented this limitation no later than March 12, 2012, and Mr. Koen corroborated it on March 14, 2012.

c. a weir, integrated horizontally into the long wall of the tank adjacent to all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot.

79. Mr. Boyd shows a TANK having a COOLANT INPUT TUBE that has U-SHAPED DRAIN TUBES for removing heated fluid. Mr. Boyd also states that "a spine on the side of the U-TUBE could act as a convenient mount point for server ears" (NOTE 1). This

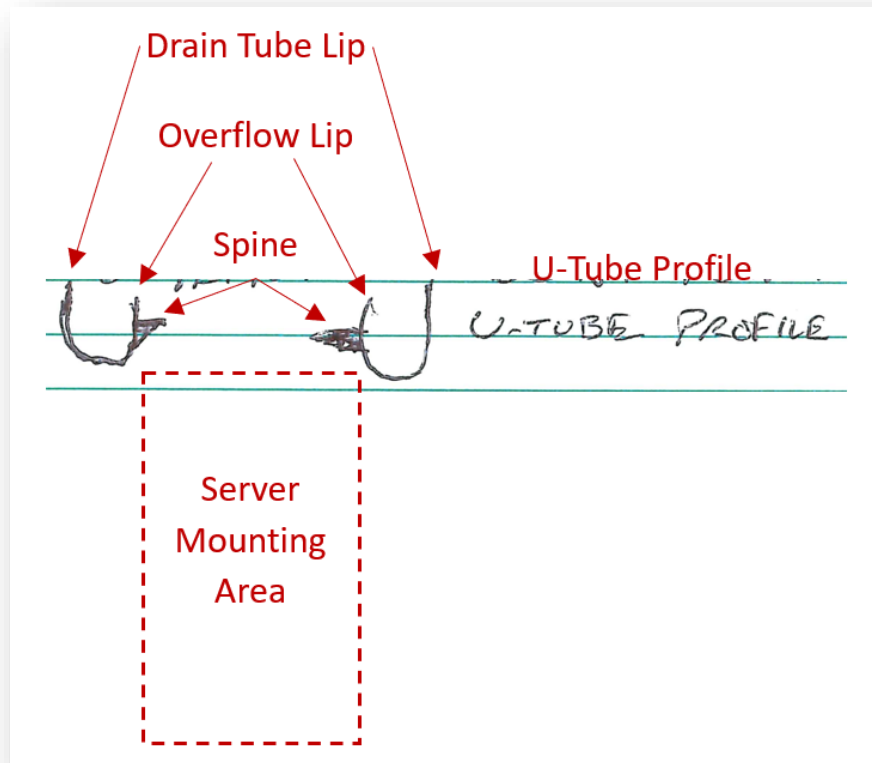
CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

shows that Mr. Boyd had the **U-SHAPED DRAIN TUBES** integrated into the full length of both long walls of the **TANK**, which would facilitate uniform recovery of the warmed dielectric fluid. Mr. Boyd also states that the **GOAL** of the invention is: “Improve forced convection cooling efficiency by avoiding mixing of coolant”. Mr. Boyd also stated, “Warm fluid overflows **U-SHAPED DRAINS** on both sides of the **TANK** wall” (**NOTE 2**). The **U-SHAPED DRAIN TUBES** thereby form a weir as claimed. (I discuss the overflow lip below). It is my opinion that Mr. Boyd invented this limitation no later than March 12, 2012, and Mr. Koen corroborated it on March 14, 2012.

d. a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip of the weir and adapted to receive the dielectric fluid as it flows over the weir.

80. Mr. Boyd shows a **TANK** having a **COOLANT INPUT TUBE**, an outflow **MANIFOLD**, and **U-SHAPED DRAIN TUBES** for removing heated fluid to a **SUMP CONTAINER**. Mr. Boyd states in **NOTE 3** that “**U-TUBES** drain into a closed **SUMP CONTAINER** for recirculation thru heat exchanger. Note that the pump cannot drain the **TANK**.” Mr. Boyd shows a **PROFILE** of his contemplated **U-TUBES**, which show an **OVERFLOW LIP**. I note in the image extraction from Page 5 that the profile shows the **SPINES** that would mount and support the several servers, which would be fully immersed. Fluid would overflow the **OVERFLOW LIP**, which is below the **DRAIN TUBE RIM**. In this way the fluid would flow upward from the outflow **MANIFOLD**, up through the **SERVER SLOTS**, over the **OVERFLOW LIP**, and flow out the **U-SHAPED DRAIN TUBES** to the **SUMP CONTAINER**. Thereby, the **SUMP CONTAINER** forms a fluid recovery reservoir as claimed. It is my opinion that Mr. Boyd invented this limitation no later than March 12, 2012, and Mr. Koen corroborated it on March 14, 2012.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER



e. a primary circulation facility adapted to circulate the dielectric fluid through the tank.

81. Mr. Boyd shows a TANK having a COOLANT INPUT TUBE, an outflow MANIFOLD, and U-SHAPED DRAIN TUBES for removing heated fluid to a SUMP CONTAINER. Mr. Boyd states in NOTE 3 that “U-TUBES drain into a closed SUMP CONTAINER for recirculation thru heat exchanger. Note that the pump cannot drain the TANK.” Mr. Boyd had a TANK, a COOLANT INPUT TUBE, an outflow MANIFOLD, two U-SHAPED DRAIN TUBES, a SUMP CONTAINER, and discussed a “pump” to “provide recirculation” through a “heat exchanger” (NOTE 3). Accordingly, these structures form a primary circulation facility as claimed. It is my opinion that Mr. Boyd invented this limitation no later than March 12, 2012, and Mr. Koen corroborated it on March 14, 2012.

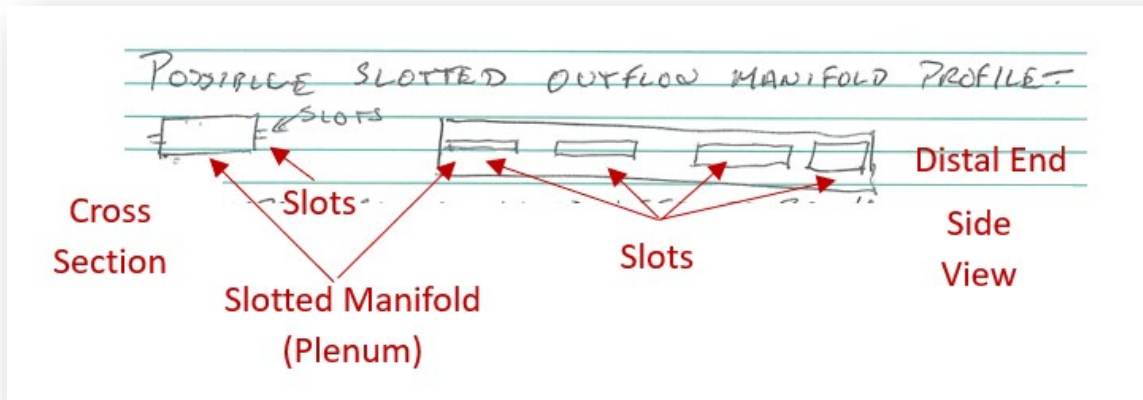
CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

f. a plenum, positioned adjacent to the bottom of the tank, adapted to dispense the dielectric fluid substantially uniformly upwardly through each appliance slot.

82. The top diagram on Page 5 of Mr. Boyd’s inventor notebook features a **TANK** that shows the **COOLANT INPUT TUBE** delivering coolant to the bottom of the **TANK** and connecting to an outflow **MANIFOLD**. Mr. Boyd states “Cold fluid flows into the tank via tube connected to a **SLOTTED MANIFOLD**. Cold fluid displaces warmer from below. Warm fluid overflows U-Shaped drains on both sides of the tank wall” (**NOTE 2**). As illustrated in the top figure on Page 5, this describes cold fluid flows into the **TANK** via the **COOLANT INPUT TUBE** that is connected to a **SLOTTED MANIFOLD** (illustrated immediately below). Cold fluid is warmed as it rises in the **TANK** and overflows into the **U-SHAPED DRAIN TUBES** on both sides of the **TANK** wall.

83. In the extracted image below, Mr. Boyd shows a **CROSS-SECTION** of the **SLOTTED MANIFOLD** and a **SIDE VIEW** of the same manifold. As illustrated, the **SLOTTED MANIFOLD** receives cooled fluid from the **COOLANT INPUT TUBE** and injects the cooled fluid through a set of **SLOTS** adjacent to the bottom of the **TANK**. As shown in the **CROSS-SECTION**, sets of **SLOTS** are positioned on both sides of the **SLOTTED MANIFOLD**, such that each side of the **SLOTTED MANIFOLD** would facilitate fluid injection. In his example on page 5, Mr. Boyd shows a **SIDE VIEW** of the slotted **MANIFOLD** where **SLOTS** are thinner toward the **COOLANT INPUT TUBE** and wider toward the **DISTAL END** of the slotted **MANIFOLD**.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER



84. Mr. Boyd defines a structure for the **SLOTTED MANIFOLD** intended to cause the fluid to be uniformly dispersed upwardly through the servers. He states: “I suspect **SLOTS** would need to be narrow on the end closest to the point where coolant is inserted and get progressively wider to account for pressure getting lower as coolant flows down the tube [**SLOTTED MANIFOLD**]. Could also use a series of progressively larger round holes” (**NOTE 4**).

85. It is my opinion that Mr. Boyd invented this limitation no later than March 12, 2012, and Mr. Koen corroborated it on March 14, 2012.

g. a secondary fluid circulation facility adapted to extract heat from the dielectric fluid circulating in the primary circulation facility, and to dissipate to the environment the heat so extracted.

86. Mr. Boyd shows a **TANK** having a **COOLANT INPUT TUBE**, an outflow **MANIFOLD**, and **U-SHAPED DRAIN TUBES** for removing heated fluid to a **SUMP CONTAINER**. Mr. Boyd states in **NOTE 3** that “**U-TUBES** drain into a closed **SUMP CONTAINER** for recirculation thru heat exchanger. Note that the pump cannot drain the **TANK**.” Mr. Boyd defined a primary circulation facility that included a **TANK**, a **COOLANT INPUT TUBE**, a **SLOTTED MANIFOLD**, two **U-SHAPED DRAIN TUBES**, a **SUMP CONTAINER**, a “pump” and a “heat exchanger” (**NOTE 3**). This primary circulation facility

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

was constructed to extract heat from the mounted servers and transfer the heat to the recirculating dielectric fluid.

87. Mr. Boyd circulates the warmed fluid to a heat exchanger (not illustrated). It is well understood in art that a heat exchanger is a device that transfers heat from one medium to another. Although no particular form is called out for the heat exchanger, Mr. Boyd uses the heat exchanger to remove heat from the circulating dielectric fluid so that it can provide cooled fluid back into the tank through the **SLOTTED MANIFOLD**.

88. It is also clear that Mr. Boyd was contemplating the use of a water-based cooling tower, which he specifically refers to on the previous page, page 4. I do note that this page is not signed by Mr. Boyd, but it is signed by Mr. Koen on March 14, 2012. However, this Page 4 appears to be a continuation of the prior page, and at a minimum shows Mr. Boyd was familiar with the use of water-cooling towers as a device to transfer heat to the environment.

89. It is my opinion that Mr. Boyd invented this limitation no later than March 12, 2012, and Mr. Koen corroborated it on March 14, 2012.

h. a control facility adapted to coordinate the operation of the primary and secondary fluid circulation facilities as a function of the temperature of the dielectric fluid in the tank.

90. Mr. Boyd testified in the deposition that he has a strong background in control systems, and that any control of an immersion cooling system would be considered a control facility. According to Mr. Boyd, a control system is simply, “something that controls something else.”⁸ Mr. Boyd worked for years in designing computer equipment for monitoring and controlling telecom providers, during which he developed significant control systems which were put into operation across telecommunication grids. For example, during his work at MCI he performed work on industrial controls.⁹ Further, during his work at Bell Northern he implemented standby protocols which would automatically control inactive messaging systems

⁸ Deposition of Christopher Boyd Vol. II at 285:25-286:8.

⁹ Deposition of Christopher Boyd Vol. I at 35:14-37:9.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

that were not operating properly.¹⁰ Based on this work experience, Mr. Boyd had considerable aptitude in developing control systems, and such systems were necessary and conventional to an immersion cooling system.

91. One of the many serious issues with the GRC GEN 1 Tank was that the fluid level in the tank fluctuated.¹¹ He attributed the fluid level problem to using one control system to control four separate tanks. The level of the coolant in each tank would change periodically with no way to predict when the level would change or to control the fluid level in each tank while the control system was operating. At one point in his deposition, Mr. Boyd stated that a 5-gallon bucket was employed to move coolant from one tank to another.¹² The lack of control over such a basic function was an incentive to Mr. Boyd to include a robust control system as part of the immersion cooling system re-design.

92. Mr. Boyd stated that part of his intention in re-designing the GRC GEN 1 Tank was to address the challenges with the on/off controller used in the GRC GEN 1 system. The controller turned on the pump and coolant circulation system when the measured coolant temperature in the tank went above a predetermined value. Once the dielectric coolant temperature was measured below the predetermined value, the pump and circulation system were turned off and the coolant became stagnant. The stagnant coolant enabled local hot spots to form at individual appliances, potentially damaging the appliances.¹³ Based on this testimony, it is clear that during the re-design process, Mr. Boyd had conceptually created a system, including a control system, with the goal of preventing hot spots at the appliances.

93. Mr. Boyd's redesign was the genesis of the Midas control system. The result allowed for the needed control and monitoring of the appliance temperatures within the tank, while reducing operating costs. Based on Mr. Boyd's testimony, that during the re-design process he desired to re-design the control system, which makes clear that the control facility

¹⁰ Deposition of Christopher Boyd Vol. I at 36:5-38:10.

¹¹ Deposition of Christopher Boyd Vol. II at 252:11-23

¹² Deposition of Christopher Boyd Vol. II at 252:11-23

¹³ Deposition of Christopher Boyd Vol. I at 123:6-129:11

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

was conceived no later than March 12, 2012¹⁴.

94. It is my opinion that Mr. Boyd invented this limitation no later than March 12, 2012, and Mr. Koen corroborated it on March 14, 2012.

95. Claim 5 of the ‘457 Patent is:

i. The system of claim 1 wherein the control facility further comprises a communication facility adapted to facilitate monitoring and control of the control facility from a remote location.

96. As discussed with reference to claim 1, Mr. Boyd had conceived of the control facility no later than March 12, 2012. Based on my discussions with him, and my understanding of his experience in remote telecommunications processes, it is my opinion that Mr. Boyd had a core belief that any control facility would preferably include a remote monitoring and control function.

97. An event associated with the GRC GEN 1 Tank that made remote monitoring and control important to Mr. Boyd was referred to as the “near meltdown of the Green Revolution Cooling system”¹⁵. Mr. Boyd went on to explain that the GRC GEN 1 cooling system failed catastrophically. Further, Mr. Boyd has expressed repeatedly that remote monitoring and control are key features of all control systems, and especially so when the system is critical infrastructure, such as an immersion cooling system.

98. It is my opinion that Mr. Boyd invented this limitation no later than March 12, 2012, and Mr. Koen corroborated it on March 14, 2012.

B. Priority Date: December 14, 2012

99. Midas filed a U.S. Provisional Application on December 14, 2012 (the “2012 Provisional Application”), to which the ‘457 Patent claims priority. The 2012 Provisional Application included Pages 4 and 5 of Mr. Boyd’s inventor’s notebook. As I concluded above, Mr. Boyd’s inventor’s notebook shows a completed conception no later than March 12, 2012, which was corroborated by Mr. Koen on March 14, 2012. As these pages are included in the

¹⁴ Deposition of Christopher Boyd Vol. 1 at 124:25-125:6

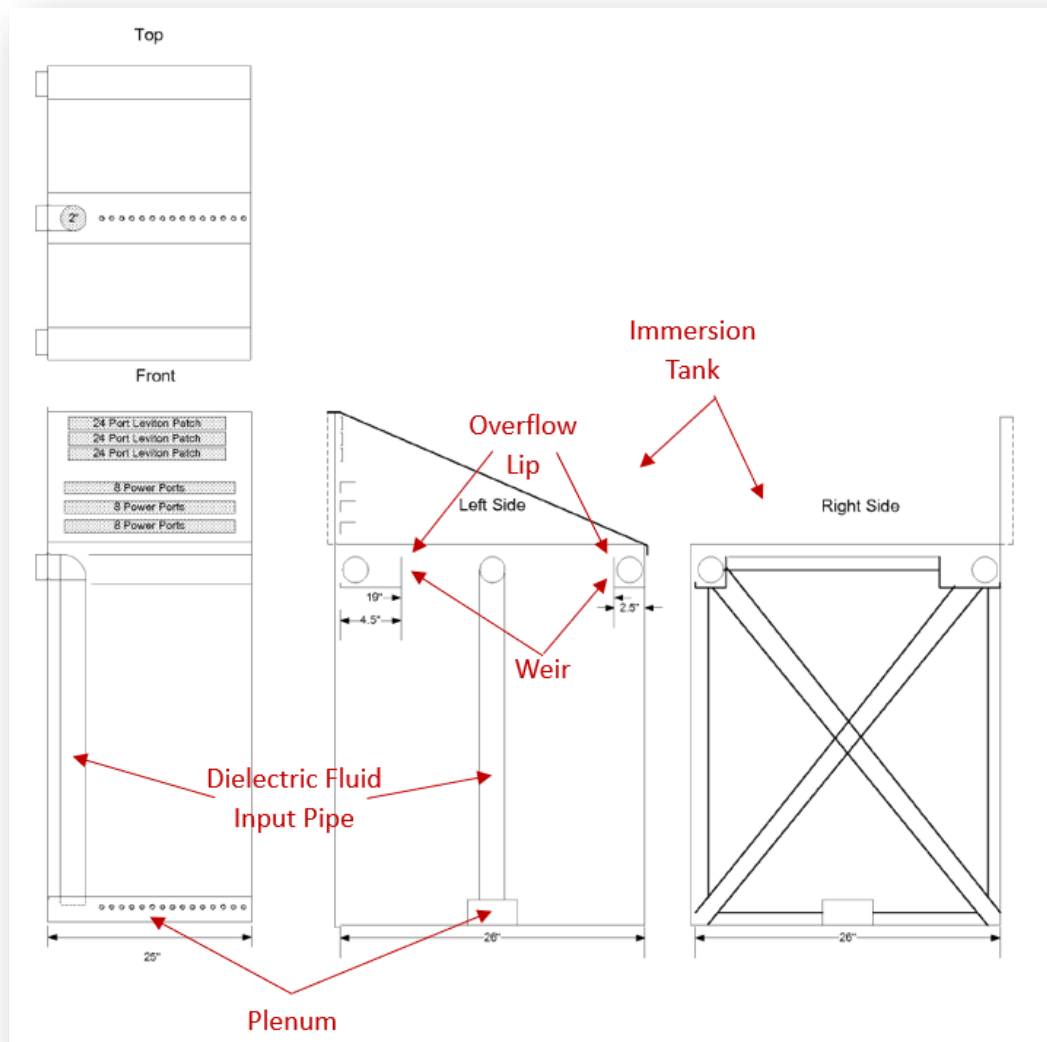
¹⁵ Deposition of Christopher Boyd Vol. 1 at 100:25

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

2012 Provisional Application, if for some reason Midas cannot maintain March 14, 2012, as the date of invention, then it is my opinion that December 14, 2012 provides priority for the Asserted Claims, based on the inclusion of Pages 4 and 5 from Mr. Boyd's inventor's notebook.

100. Additionally, the 2012 Provisional Application has the following diagram, which Mr. Boyd testified represents a sketch that he had made for Jeffrey Van Myers, Midas' Patent Prosecuting Attorney. As annotated below, the diagram shows an immersion cooling tank that includes a coolant inlet pipe, a plenum adjacent to the bottom of the tank for dispensing dielectric coolant, and two weirs, one on each of long walls of the tank, with an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid. A diagram of the same tank, shown one page earlier in the 2012 Provisional Application, includes a note that states "Servers rest on inside rail." with an indicating arrow pointing to the weirs on opposite sides of the tank. The features of the diagram are a formalized version of the sketch at the top of Page 5 of Mr. Boyd's inventor's notebook.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

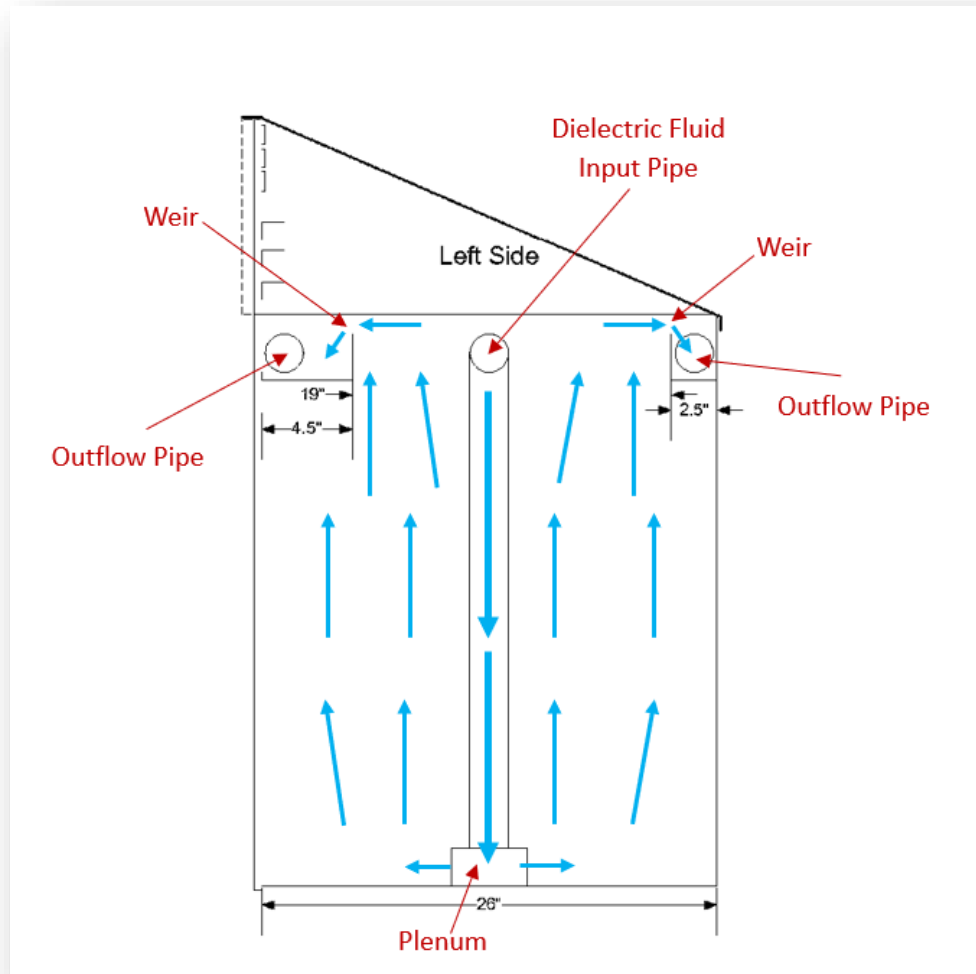


101. As annotated above, the figure from the 2012 Provisional Application has a **DIELECTRIC FLUID INPUT PIPE** that connects to a **PLENUM** adjacent the bottom of the **IMMERSION TANK**. The **PLENUM** is shown as a rectangular channel with spaced apart round holes in the top and on each side of the channel that appear to run the length of the **IMMERSION TANK**. Dielectric fluid is pumped into the **DIELECTRIC FLUID INPUT PIPE** and flows into the **PLENUM** channel, where the round holes would dispense the dielectric fluid into the **IMMERSION TANK**. The fluid would rise through the servers mounted in the **IMMERSION TANK** due to the elevated pressure of the coolant exiting the **PLENUM**, and natural convection

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

caused by the warming coolant. When the warmed coolant gets to the top of the **IMMERSION TANK**, it flows over the **OVERFLOW LIP** of the **WEIR**. An **OUTFLOW PIPE**, under gravity flow, moves the dielectric fluid to a collection facility (not illustrated).

102. The fluid flow discussed above is generally depicted in blue arrows in the annotated extracted image below:



103. It is my opinion that the 2012 Provisional Application is a constructive reduction to practice of Mr. Boyd's invention and demonstrates diligence as it was filed by a patent attorney within approximately nine months of the March 14, 2012 date of conception. It is my understanding that Mr. Van Myers was engaged by Midas for patent services regarding this invention at least by July 28, 2012.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

104. Dr. Ortega includes the “Left Side” and “Right Side” views from this diagram on page 87 of his report. However, in paragraph 212, he incorrectly concludes that the tank from the diagram above uses “spray bars and spray heads.” Instead, the tank from the above diagram has a single channel structure adjacent to the bottom of the tank that functions as a plenum.

105. The 2012 Provisional Application does disclose an embodiment of the invention that utilizes spray bars and spray heads. This embodiment is described from pages 8-15 of the 2012 Provisional Application and references Figures 1, 2 and 3. These three figures feature spray bars and spray heads, and the narrative includes variations of a spray bar/spray head embodiment, including control methodologies and hardware.

106. By contrast, the figures from page 87 of Dr. Ortega’s report, and all of the figures listed in the 2012 Provisional Application after page 15 (the last page of the spray bar and spray head narrative), have substantially different features than Figures 1, 2 and 3 of that provisional. Instead, the figures listed after page 15 of the 2012 Provisional Application resemble the top sketch from Page 5 of Mr. Boyd’s inventor’s notebook, namely they contain an immersion cooling tank that includes a coolant inlet pipe, a plenum adjacent to the bottom of the tank for dispensing dielectric coolant, and two weirs, one on each of the long walls of the tank, with an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid.

107. It is for these reasons that I believe Dr. Ortega incorrectly interpreted the “Left Side” and “Right Side” figures on page 87 of his report.

C. Priority Date: June 7, 2013

108. It is my understanding that by October 16, 2012, Midas had engaged Deaton Engineering (“Deaton”) to complete the detailed mechanical design for their new immersion cooling tank. As a result of that engagement, Deaton prepared P&ID (Piping and Instrumentation Diagram) schematic diagrams, several of which were submitted as U.S. Provisional Application No. 61/832,211 on June 7, 2013 (the “2013 Provisional Application”). In the 2013 Provisional Application, Midas submitted seven Deaton P&ID schematics, a first P&ID, and then six others that are identified in their respective upper left corner as B, C, D, E, F, or G (the “Seven Deaton

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

Diagrams”).

109. Each of the Seven Deaton Diagrams has a primary circulation facility that has cooled dielectric fluid dispensed into an immersion cooling tank and warmed fluid removed from the tank. A set of valves regulates the flow of fluid through each tank during cooling operations. The temperature of the fluid is monitored, and when a threshold is exceeded, the pump for that tank starts (or its speed changes/increases).

110. The fluid is pumped to a heat exchanger, where heat from the dielectric fluid is transferred to water flowing in the heat exchanger. The tank, pump, and heat exchanger are part of a primary circulation device. A POSITA would understand to use the immersion tanks as set out in the 2012 Provisional Application to provide the needed teachings to build the specific plenum and weir structures for each tank.

111. As discussed above, when the fluid in a tank reaches a certain threshold, then the pump is turned on or its speed proportionally adjusted. When the dielectric fluid pump starts, the water pump and the fans for the cooling tower also start. The water pumps circulate cooled water into the heat exchanger(s), where heat from the dielectric fluid is transferred into the water. The water continues to circulate to the cooling tower(s), where the water is cooled and then returns to the heat exchanger(s). In two of the Seven Deaton Diagrams, F and G, the speed of the fans for the cooling towers is adjusted to maintain the output water temperature of the water at 95 degrees Fahrenheit. In the other designs the cooling tower fans turn on when the dielectric fluid pump(s) start and run for 30 minutes after the dielectric fluid pumps shut off. The water circulating through the heat exchanger and the cooling tower is a secondary circulation facility that extracts heat from the dielectric fluid and transfers it to the environment.

112. Below is duplicated the “Notes” on the B Diagram of the Seven Deaton Diagrams. It shows that each tank has an on/off control and an oil pump that regulates the dielectric fluid through the tank during cooling operations. The oil pump is turned on when the temperature of the dielectric fluid exceeds 95 degrees Fahrenheit. At the same time, the system of the B diagram turns on the water pump and the cooling fans for the cooling tower. When the

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

temperature of the dielectric fluid falls below 95 degrees Fahrenheit, then the oil pump is turned off. The water pump and the cooling tower fans will run for 30 minutes and then shuts off (provided the dielectric fluid stays below 95 degrees Fahrenheit.)

NOTES:

1. ON/OFF CONTROL PER TANK
2. OIL PUMP AT EACH TANK WILL REGULATE FLOW TO TANKS DURING COOLING OPERATION BASED ON HEAT OF EACH TANK.
3. WHEN TEMPERATURE IN ANY SERVER TANK RAISES ABOVE 95 F THE OIL PUMP FOR THAT TANK, WATER PUMP, AND COOLING TOWER FAN ALL START.
4. WHEN TEMPERATURE IN THAT SERVER TANKS DROPS BELOW 95 F THE OIL PUMP TURNS OFF.
5. WHEN THE OIL PUMP TURNS OFF THE WATER PUMP AND COOLING TOWER FAN CONTINUE TO RUN FOR 30 MINUTES.
6. ANY UNUSED SERVER TANKS ARE MANUALLY VALVED OUT.
7. ADDED LEVEL SENSOR TO COOLING TOWER WATER.

113. It is my opinion that the 2013 Provisional Application is a constructive reduction to practice of Mr. Boyd's invention and demonstrates diligence as it reflects P&ID drawings and manufacturing schematics generated by Deaton at Midas's direction.

D. Priority Date: December 13, 2013

114. It is my opinion that Mr. Boyd conceived the invention of claim 1 (as corroborated) no later than March 14, 2012, and that it was constructively reduced to practice by the filing of the December 2012 Provisional Application, or in the alternative, by the filing of the June 2013 Provisional Application. It is also my opinion that Midas acted diligently from March 14, 2012, until constructive reduction to practice. Although I believe it very unlikely to be needed, the filing of the December 13, 2013, U.S. Utility Application could also be considered a constructive reduction to practice.

E. Diligence Timeline

115. Below is a table showing dates of selected activities showing that Midas diligently worked from the date of conception (March 12, 2012) to the filing of the full U.S. Utility Application (December 13, 2013). It is my opinion that Midas acted diligently, which fully supports a March 14, 2012, date of invention.

- March 12, 2012-March 14, 2012 (lab notebook pages MIDAS0000036, MIDAS0040993)

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

- April 20, 2012 – Inquiry re Power Consumption (MIDAS0046362)
- April 24, 2012 – Tank Design Drawing (MIDAS0046355; MIDAS0046356; MIDAS0046357; MIDAS0046358-61)
- June 2, 2012 – Research re liquid cooled computers (MIDAS0319275)
- June 18, 2012 – PCD visits Midas (MIDAS0319269; MIDAS0319469)
- June 24, 2012 – Business Model (MIDAS0046368-69)
- July 28, 2012 – Jeffrey Van Myers engaged with Midas
- August 13, 2012 – Marketing/design considerations for PCD (MIDAS0046378)
- Aug 26, 2012 – Tank design sent to Jeffrey Van Myers
- Sept 21, 2012 – Spec sheet from PCD (MIDAS0046382)
- Oct. 3, 2012- Next steps to manufacture and IP (MIDAS0006908)
- Oct. 5, 2012 – Video conference with patent attorney
- Oct. 12, 2012- Midas reaches out to investors (MIDAS0046421)
- Oct. 16, 2012 – Midas meets with Deaton Engineering (MIDAS0324869)
- Oct. 25, 2012 – Updated Business plan (MIDAS0006935-60)
- Oct. 31, 2012- Tank Design (MIDAS0006968-71)
- Oct. 31, 2012 – Marketing/Design Spec Sheet from Deaton (Deaton003274)
- Nov. 6, 2012 – Deaton provides budget for tank manufacture (MIDAS0008188-91)
- Nov. 26, 2012 – Midas board meeting re business growth plan and current state (MIDAS0189926; MIDAS046398-99)
- Dec. 3, 2012 – Business plan and valuation for Midas (MIDAS0325204, MIDAS0325205; MIDAS0325206)
- Dec. 6, 2012 – Confirmed engagement with Deaton (MIDAS0008389)
- Dec. 14, 2012 – Filed Provisional Appl. 61/737,200 (MIDAS0000001-51)
- Jan. 25, 2013 – Deaton provides SOW and proposal for tank (Deaton010523-24)
- Feb. 7, 2013 – Oil Cooling system Concept discussion (Deaton010597)
- Feb. 11, 2013- Control system interface structure change (Deaton010648; Deaton010650)
- Feb. 19, 2013 - Control System Design Spec. (MIDAS0008749-50)
- Feb. 20, 2013 – Controls interface discussion (Deaton010700)
- March 12, 2013 - Sends \$25k to Deaton to manufacture and build tank (Deaton010776)
- June 7, 2013 – Second provisional application
- July 2013 – Midas sends \$20k to Deaton for initial design and fabrication (Deaton011464)
- Aug. 8, 2013- “Construction phase’ (Deaton011617)
- Oct. 4, 2013- Deaton provides documents for patent application (MIDAS0328582)
- Nov. 22, 2013 – Signed Lease for 6th Street Location (MIDAS0334924)
- Dec. 13, 2013 – Patent filed
- Jan 23, 2014 – Current set of drawings (MIDAS0329965)
- Jan 30, 2014 – Estimate to Complete MGT Immersion cooling system (MIDAS0330146)
- Feb. 12, 2014 - Working to pour concrete at 6th Street location for cooling towers (MIDAS0100988)

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

- April 27, 2014 – Meeting with Deaton at Midas’ new location 6th Street (MIDAS0069351)
- April 27, 2014 – Lids are too flimsy (MIDAS0069355)
- July 25, 2014 – Demo of tank (MIDAS0020581)
- Sept. 7, 2014 – Open House – CH3 Data center and Midas Green Tech (Deaton012874)

X. VALIDITY UNDER 35 U.S.C. §112

116. At paragraph 411 of his Report, Dr. Ortega expressly states he has no opinion as to the ultimate question of whether the ‘457 Patent meets the written description and enablement requirements of 35 USC § 112. He does, however, discuss the disclosures of the plenum and weir in the ‘457 Patent, and expresses an opinion that these are deficient to support the written description and enablement requirements. I believe Dr. Ortega is incorrect in his reading of the disclosures in the ‘457 Patent, and I address both plenum and the weir below. In my opinion, Dr. Ortega has not provided any evidence or argument to meet its burden on the ultimate questions of whether the ‘457 Patent meets the written description and enablement requirements of 35 U.S.C. § 112. I do, however, discuss below the sufficiency of the disclosures of the plenum and weir in the ‘457 Patent to fully support the written description and enablement requirements.

A. Disclosure Of The Plenum In The ‘457 Patent

117. In paragraph 413 of his report, Dr. Ortega asserts, with no support, that he believes the plenum of the ‘457 Patent is too narrow, e.g. “As depicted in Fig. 1, the plenum is much too narrow (that is, too low in relation to the scale of the tank)” and that “a POSA would have to do considerable additional work and experimentation to determine the correct height for the plenum given the other dimensions of the tank.” I disagree. First, a POSITA would understand that the performance, or flow characteristics, of a non-circular chamber, such as a plenum, depends on the hydraulic radius ($R = \text{Area}/\text{Wetted Perimeter}$) of the chamber and not just the height.¹⁶ One skilled in the art would also understand that combining the description of the plenum in the ‘457 Patent, and the design parameters of appliances being cooled, e.g. size and number of appliances, heat generated per unit, temperature requirements, cooling fluid properties, etc. with a computational fluid dynamics (CFD) modeling tool, will produce multiple

¹⁶ Applied Fluid Dynamics, 6th ed., Mott, Robert L, Pearson Prentice Hall, 2006

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

plenum designs that dispense the dielectric fluid substantially uniformly upwardly through each appliance slot with no more work or experimentation than required of a typical detailed design of a cooling system.¹⁷

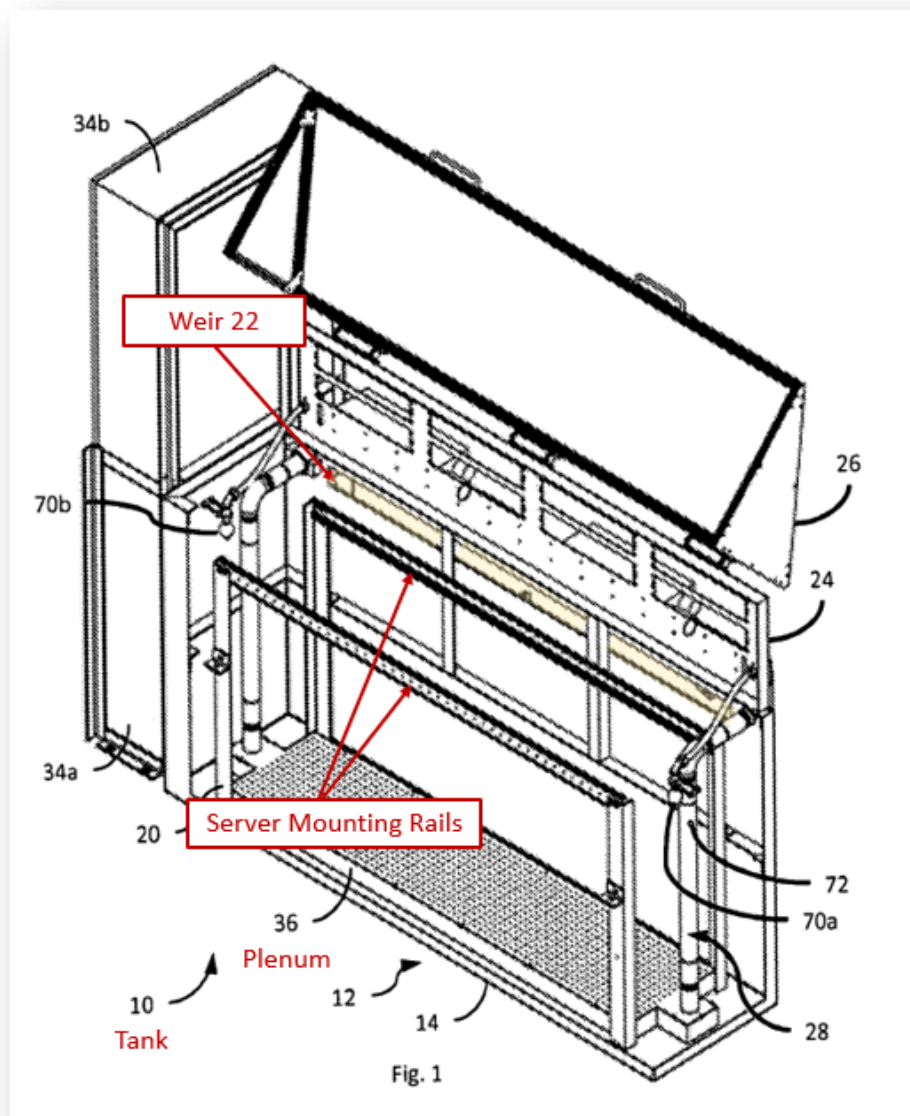
118. As to the plenum and the information required to reduce it to practice, it is my opinion that the '457 Patent discloses to one skilled in the art (1) that the inventor had possession of the invention, and (2) how to make and use the plenum without undue experimentation.

¹⁷ <https://www.cfd-online.com>

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

B. Disclosure Of The Weir In The ‘457 Patent

119. In paragraph 415 of his Opening Report, Dr. Ortega asserts, with no support, that he believes the top of the fluid level “appears to coincide with the top of the electrical appliances.” Dr. Ortega then extrapolates this wrong assumption to conclude that the weir disclosed in the ‘457 Patent would not facilitate uniform recovery of the fluid. As clearly illustrated in annotated Fig. 1 of the ‘457 Patent, below, the “Weir 22” is shown on “Tank 10” well below the rails on which the servers (electrical appliances) are mounted. To facilitate this description, I have shaded the weir in a light yellow.



CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

120. As the overflow lip of the weir is clearly shown to be positioned well above the mounting rail for the servers, it is my opinion that the ‘457 Patent discloses to one skilled in the art: (1) that the inventor had possession of the invention; and (2) how to make and use the weir without undue experimentation.

XI. DISCUSSION OF PRIOR ART TO BE CONSIDERED

A. March 14, 2012, As The Priority Date

121. Dr. Ortega used 10 references (the “Cited References”) in his Opening Report. Each is briefly discussed below.

1. GRC GEN 1 Tank (The Best Tank)

122. I have been informed that Green Revolution Cooling (“GRC”) sold an immersion cooling system to Texas Advanced Computing Center (“TACC”) in spring of 2010. A few months later, in about August 2010, GRC sold Midas Networks four tanks, which I refer to as the GRC GEN 1 Tanks. GRC installed the tanks on about January 15, 2011. Mr. Boyd was an employee of Midas Networks, and Midas Networks used the GRC GEN 1 Tanks to cool servers that ran websites for customers.

123. The GRC GEN 1 Tanks used a pump and an injection manifold to inject dielectric fluid into a tank. The injection manifold was positioned on one of the long sides of the tank and adjacent to the top of the tank, just under the level of the dielectric fluid. It is unclear if the injection manifold used holes to inject the fluid, or if at some point, pipes were connected to the holes in the manifold in an attempt to transport the cold dielectric coolant deeper into the tank. These holes (or possibly pipes) were on the bottom surface of the injection manifold.

124. The incoming coolant, which was externally cooled, was injected into the top portion of the tank via the downward facing injection manifold. The elevated pressure in the manifold, due to the coolant pump, accelerated the coolant as it passed through the holes or pipes. According to Christiaan Best, a “relatively quick motion” of the coolant was required for the system to cool the appliances. This, combined with the viscosity of typical dielectric coolants, indicate that the coolant, in all likelihood, exited the holes or pipes of the manifold in a

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

turbulent flow condition.¹⁸ When the turbulent flow of the entering coolant came in contact with the coolant in the tank, extensive mixing and churning of the coolant occurred. The mixing and churning caused the coolant to flow in multiple directions including toward the servers, towards the multiple open spaces between the servers, towards the side of the tank, and toward the bottom of the tank. Due to the turbulence induced mixing and the multitude of available flow paths, I would expect almost none of the injected coolant would have found a direct path to the bottom of the tank.

125. The GRC GEN 1 Tanks also employed a suction manifold, which was adjacent to the long wall opposite the injection manifold and was also positioned at the top portion of the tank. The suction manifold contained plugged holes and pipe nipples on its top surface that had to be kept well below the top surface of the fluid. The suction manifold was connected to the suction side of the coolant pump, which created a negative pressure in the manifold. The negative pressure drew fluid into the suction manifold from the top portion of the tank. The fluid was pumped to a heat exchanger where the fluid was cooled, and then returned to the tank using the previously described injection manifold. If the level of the coolant was not maintained at a level sufficiently above the pipe nipples (of the suction manifold), air would be ingested into the system and the coolant pump would cavitate (a dangerous condition that may cause a pump to fail catastrophically).

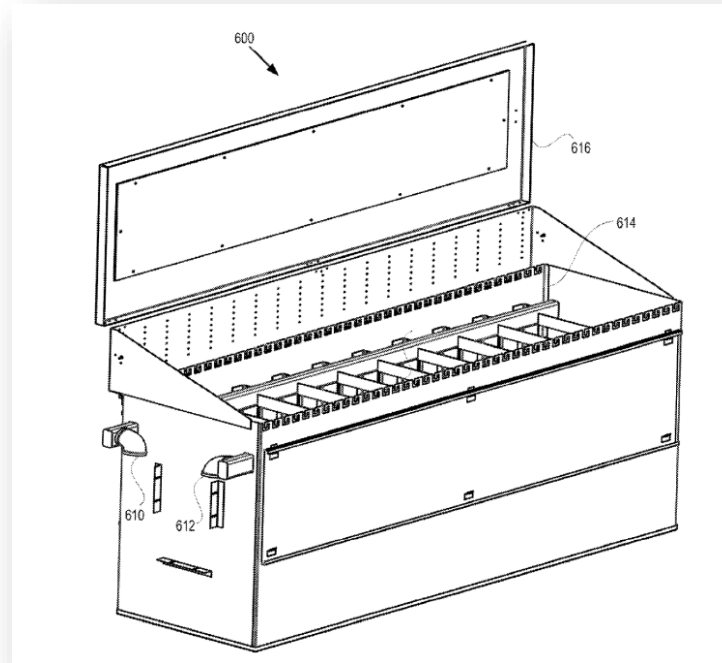
126. Mr. Best, in his declaration, stated that “The four Best Tanks [GRC GEN 1 Tanks] are only visually similar to the tanks outlined in Figure 6 of the ‘412 publication (the “Best Publication”).” While Fig. 6 (duplicated below) shows an immersion tank, there is very limited detail in the figure. Further, the only discussion of Fig. 6 in the narrative of the 2014 Best Publication is paragraph [0068]. I also note that Mr. Boyd and Mr. Koen found multiple visual differences between the GRC GEN 1 Tank and Fig. 6 of the Best Publication.¹⁹ Both the GRC GEN 1 Tank and Fig. 6 of the 2014 Best Publication can be identified as an immersion cooling tank, but very limited additional information is available. I find this visual comparison to be

¹⁸ Deposition of Christiaan Best at 40:4-17.

¹⁹ Deposition of Christopher Boyd Vol. II at 210:24-213:6; Deposition of Jim Koen 140:17-141:6

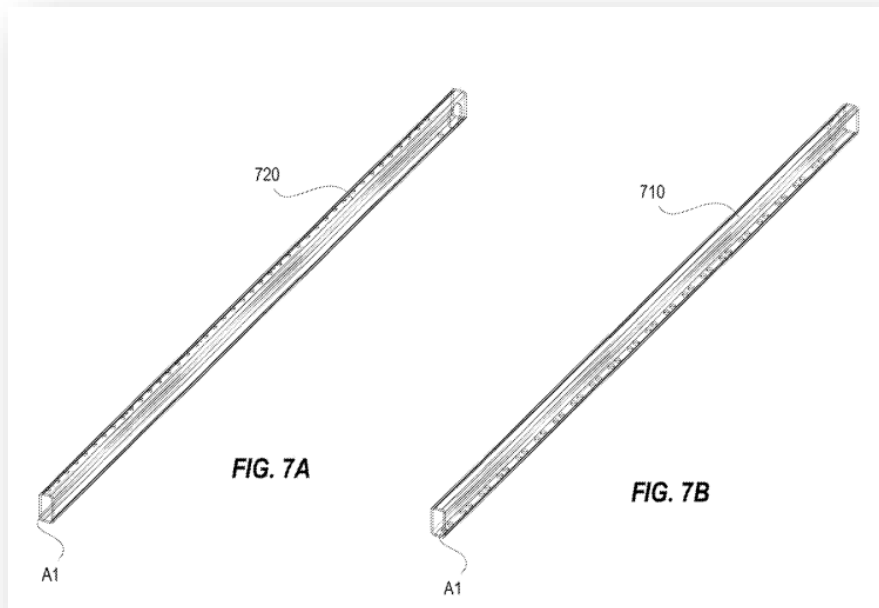
CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

superficial and insignificant to a thorough and comprehensive invalidity analysis.



127. Mr. Best, in a declaration, stated that “The manifolds of the Best Tanks [GRC GEN 1 Tanks] were approximately as described in Figure 7A and 7B of the ‘412 Publication.” In [0069] the 2014 Best Publication states that the pressure manifold 710 (Fig. 7B) connects to the coolant inlet 612 (Fig. 6), and that the suction manifold 720 (Fig. 7A) connects to the coolant outlet 610 (Fig. 6). Both the suction and the pressure manifolds have the same area A_1 , and both the suction and pressure manifolds have nozzles, or velocity augmentation devices, distributed along the length of the respective manifold. The aggregated area of the nozzles, or velocity augmentation devices, of each manifold (suction manifold and pressure manifold) sums to a total of area A_2 .

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER



128. Mr. Best, in his declaration, stated that “The flow of the oil inside the Best Tanks installed at Midas' facilities was approximately as described in paragraphs [0069] through [0073] of the '412 Publication [Best Publication].” In [0069-70], the 2014 Best Publication states that the suction manifold has an area A1 (Fig. 7A) and that it has nozzles or other velocity augmentation devices distributed along its length. The 2014 Best Publication states that the aggregated area of the openings for the nozzles or augmentation devices sums to a total of area A2 (not illustrated). The 2014 Best Publication goes on to state that the area A2 must be much smaller than the area A1, which allows for the pressure loss through the nozzles to be much greater than the pressure loss through the suction manifold, which, as a consequence, sets the pressure across the nozzles to be approximately equal over the length of the suction manifold.

129. Mr. Boyd has informed me that in his best recollection of the GRC GEN 1 Tanks, both the suction manifold and the pressure manifold were most likely 3 x 1.5-inch stock rectangular tubing, and possibly constructed with 14-gauge walls. If so, he estimates the cross-sectional area to be about 3.85 square inches, which would be the area A1. As to the suction

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

manifold, the GRC GEN 1 Tanks were constructed to hold 42 servers (a 42U tank). It is my understanding that through-holes were spaced 1U apart on the top of the suction manifold, and that a nozzle was placed into every third hole, with the intervening two holes plugged. It is Mr. Boyd's recollection that there may have been about 13 nozzles, and that each nozzle had an opening or inside diameter (ID) of at least 3/16 inch, and possibly 1/4 inch. Provided there were 13 nozzles with an ID range between 3/16" and 1/4", that would be a total aggregate suction area of between 0.36 and 0.64 square inches, which is the span of estimates for area A2. While this is slightly less than 10% to just over 16% of Area A1, considering the high level of uncertainty associated with the specific dimensions of the suction manifold and nozzles, I am unable to reach an opinion as to whether the area A2 is "much smaller than the area A1" for the GRC GEN 1 Tank.

130. I have not seen any evidence, or any material that Dr. Ortega relied upon, to show that the aggregate area A2 of the nozzles mounted on the suction manifold of the GRC GEN 1 Tank is much smaller than the cross-section area A1 of the suction manifold. Dr. Ortega performs no comparison in his report.

131. In speaking with Mr. Boyd, he has informed me that during operation the level of dielectric fluid would, from time to time, get too low, and the nipples would begin sucking air into the suction manifold due to the negative pressure created by the pump. Each nipple sucking air would make a whistling noise as the air passed through the nipple. Mr. Boyd has informed me that the pitch of the whistle was higher at the "pump" end of the suction manifold, and lower at the distal end of the suction manifold. This indicates that the negative pressure acting on a nozzle nearer the pump was greater than the negative pressure acting on a nipple farther from the pump. It is my opinion that this is a strong indication that the negative pressure along the length of the suction manifold was not approximately equal along the entire length of the tank, as required in [0070] of the Best Publication. As a result, Dr. Ortega's assumption that the GRC GEN 1 Tank has a fluid flow as set out in paragraphs [0069] to [0073] of the 2014 Best Publication is both unsupported and incorrect.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

132. As to the pressure manifold, I have seen no evidence of what structure was on its underside that injected the fluid into the tank. For example, it could be just holes, and if so, I have seen no evidence of how many or of what size. It could be a set of nozzles, and if so, I have seen no evidence of how many or of what size. Thus, there is no basis for which to calculate an area A2 for the pressure manifold. I have not seen any evidence, or any material that Dr. Ortega relied upon to show that the area A2 of nozzles mounted on the pressure manifold of the GRC GEN 1 Tank is much smaller than the cross-section area A1 of the pressure manifold. As a result, Dr. Ortega's assumption that the GRC GEN 1 Tank has a fluid flow as set out in paragraphs [0069] to [0073] of the 2014 Best Publication is both unsupported and incorrect.

133. Additionally, paragraph [0069] states that "Both the suction manifold 720 and the pressure manifold 710 have a plurality of nozzles or velocity augmentation devices of an area A2 distributed along their length. I interpret this to mean that the area A2 for the suction manifold must be substantially the same as the area A2 for the pressure manifold. I have seen no evidence that would allow me (or Dr. Ortega) to conclude that area A2 for the suction manifold is substantially the same as the area A2 for the pressure manifold in the GRC GEN 1 Tank. As a result, Dr. Ortega's assumption that the GRC GEN 1 Tank has a fluid flow as set out in paragraphs [0069] to [0073] of the 2014 Best Publication is both unsupported and incorrect.

2. The Best '463 Patent

134. The Best '463 Patent was filed on August 10, 2009. This application was granted November 6, 2018.

135. The Best '463 Patent is titled, "Liquid Submerged, Horizontal Computer Server Rack and Systems and Method of Cooling Such a Server Rack," and "provides novel apparatus, systems, and methods for efficiently cooling computing devices having heat-generating electronic components, such as, for example, independently operable servers immersed in a dielectric liquid coolant in a tank." It teaches a system that includes (1) at least one tank, having a coolant inlet and a coolant outlet; (2) one or more mounting members; (3) a dielectric liquid coolant; (4) a heat exchanger; (5) a pump; and (6) a controller.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

136. The Best ‘463 Patent claims priority to three provisional patent applications filed between 2008 and 2009.

137. The Best ‘463 Patent was cited by the patent examiner during the prosecution of the ‘457 Patent.

3. The Oktay ‘244 Patent

138. The Oktay ‘244 Patent was filed June 7, 1966.

139. The Oktay ‘244 Patent is titled, “Multi-Liquid Heat Transfer,” and discloses a heat transfer apparatus for cooling heat generating electronic devices by immersing the electronic devices in a dielectric liquid that has a low temperature boiling point. A second liquid that has a higher boiling point than the dielectric liquid is superimposed on the free surface (upper surface) of the dielectric liquid. The second liquid is maintained at a predetermined temperature using a heat exchanger. The dielectric liquid boils at atmospheric pressure slightly above ambient room temperature. When the dielectric liquid is heated, bubbles form and condense at the interface between the liquids.

140. The Oktay ‘244 Patent discloses a two-phase immersion cooling system. Two-phase systems are inherently incomparable to a single-phase immersion cooling system at issue in this case.

141. The Oktay ‘244 Patent has no weir as claimed to facilitate uniform recovery of the dielectric fluid.

142. The Oktay ‘244 Patent has no dielectric fluid recovery reservoir as claimed.

143. The Oktay ‘244 Patent has no primary circulation facility to circulate dielectric fluid through the tank as claimed.

144. The Oktay ‘244 Patent has no plenum as claimed.

4. The JP ‘758 Patent

145. The JP ‘758 Patent (Japanese Patent No. JPH04116758) was filed March 29, 1991.

146. The JP ‘758 Patent is titled, “Liquid Cooling Bias Test Equipment,” and discloses

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

a testing apparatus which seeks to determine the benefits of immersing objects in coolant. The objective of the apparatus is to perform a bias test on the electronic equipment to limit moisture adhesion which could cause impurities by interacting with semiconductor wiring patterns. The impurities could potentially cause errors in a bias test on said equipment. Because the goal of this device was not to perform immersion cooling, but rather to aid in the performance of semiconductor bias testing, this device is not useful prior art.

147. The JP ‘758 Patent does not have a weir as claimed.

148. The JP ‘758 Patent does not disclose any fluid recovery reservoir as claimed.

149. The JP ‘758 Patent does not disclose a plenum as claimed.

5. The Pfahnl Application

150. The Pfahnl Application was filed on December 14, 2004.

151. The Pfahnl Application is titled “Air Cooling Architecture for Orthogonal Board Architectures,” and discloses a system, depicted below, that uses air for cooling orthogonally oriented arrays of parallel circuit boards and is particularly well suited for data centers. “Air is drawn into the front of the system, passes alongside the circuit boards in the first array, takes a 90-degree turn, continues over the circuit boards in the second array.” (from the Abstract of The Pfahnl Application)

152. The Pfahnl Application does not disclose an immersion cooling system housing a plurality of circuit boards. Because this system discloses an apparatus for computer circuit board direct air cooling, this system is not comparable to the systems at issue in this case.

153. The Pfahnl Application utilizes air as the dielectric fluid and as such cannot contain a weir, or an overflow lip, or a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip.

154. The Pfahnl Application does not disclose a secondary fluid circulation facility.

155. The Pfahnl Application does not disclose a control facility adapted to coordinate the operation of the primary and secondary fluid circulation facilities.

156. The Pfahnl Application was cited by the patent examiner during the prosecution

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

of the ‘457 Patent.

6. The Quon ‘108 Patent

157. Quon ‘108 Patent was filed November 2, 1993.

158. The Quon ‘108 Patent is titled, “Cooling of Semiconductor Power Modules by Flushing with Dielectric Liquid,” and discloses a system for cooling an electronic power module that consists of semiconductor dies mounted on a printed wiring board by flushing the electronic power module with dielectric liquid coolant.

159. The Quon ‘108 Patent discloses a dielectric cooling system that houses the power module of the semiconductor chip. The patent discloses that only the power module of the semiconductor would be immersed. The chip of the semi-conduct would remain not immersed in the dielectric fluid but would be connected by dies outside of the immersed power module. Therefore, this cooling apparatus does not enclose the entire structure of the computer equipment. Thus, the structure of this cooling mechanism differs on both scope and scale of its cooling function from the ‘457 Patent.

160. The Quon ‘108 Patent does not disclose a tank adapted to immerse in a dielectric fluid a plurality of electrical appliances, each in a respective appliance slot distributed vertically along, and extending transverse to, a long wall of the tank.

161. The Quon ‘108 Patent does not disclose a weir, integrated horizontally into the long wall of the tank adjacent to all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot.

162. The Quon ‘108 Patent does not disclose a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip of the weir and adapted to receive the dielectric fluid as it flows over the weir.

163. The Quon ‘108 Patent does not disclose a primary circulation facility adapted to circulate the dielectric fluid through the tank.

164. The Quon ‘108 Patent does not disclose a secondary fluid circulation facility adapted to extract heat from the dielectric fluid circulating in the primary circulation facility, and

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

to dissipate to the environment the heat so extracted.

165. The Quon '108 Patent does not disclose a control facility adapted to coordinate the operation of the primary and secondary fluid circulation facilities as a function of the temperature of the dielectric fluid in the tank.

7. The Rolfson '298 Patent

166. The Rolfson '298 Patent was filed August 22, 2000.

167. The Rolfson '298 Patent is titled, "Method and Apparatus for Uniformly Baking Substrates Such as Photomasks," and discloses a method and apparatus for maintaining a liquid bath at a constant and uniform temperature for semiconductor fabrication.

168. The Rolfson '298 Patent is designed to bake film on substrates. The goal of the invention is to heat the film and substrate to the optimal temperature to allow the film on the surface of the substrate to bake. This invention does not disclose a cooling apparatus, and therefore is not reasonably capable of being considered prior art as the operation of this device is directly inverse to the operation of the '457 Patent.

169. The Rolfson '298 Patent discloses a baking apparatus for use in semiconductor fabrication and not an appliance immersion cooling system.

170. The Rolfson '298 Patent discloses propylene glycol or similar fluid as the coolant which is not a dielectric fluid.

171. The Rolfson '298 Patent discloses a retaining device that holds the semiconductor for fabrication which is only partially disposed within the primary tank as opposed to the immersed appliances of the '457 Patent that are distributed vertically along, and extending transverse to, a long wall of the tank.

172. The Rolfson '298 Patent discloses utilizing a baffle or a series of baffles to control the flow of the liquid bath and properly disperse it and not a plenum.

8. The Attlesey '419 Patent

173. The Attlesey '419 Patent was filed October 12, 2010.

174. The Attlesey '419 Patent is titled, "Liquid Submersion Cooling System," and

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

discloses a portable, self-contained system for cooling electronic components by submersion in a dielectric liquid. The heat generating components of the electronic device are submerged in dielectric cooling liquid in a tank. A pump transports warm dielectric cooling liquid from the top of the tank, to outside of the tank, into a heat exchanger, which appear as radiators on the sides of the tank. The pump can be submerged in the cooling liquid within the interior space or can be disposed outside the interior space. The electronic device may rely on convection of the dielectric cooling liquid, thereby eliminating the need for a pump.

175. The Attlesey '419 Patent does not disclose a tank adapted to immerse in a dielectric fluid a plurality of electrical appliances, each in a respective appliance slot distributed vertically along, and extending transverse to, a long wall of the tank.

176. The Attlesey '419 Patent does not disclose a weir, integrated horizontally into the long wall of the tank adjacent all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid.

177. The Attlesey '419 Patent does not disclose a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip of the weir.

178. The Attlesey '419 Patent does not disclose a plenum, positioned adjacent the bottom of the tank.

179. The Attlesey '419 Patent was cited by the patent examiner during the prosecution of the '457 Patent.

B. December 13, 2012, As The Priority Date

180. All the references cited for March 14, 2012, Priority Date plus the following:

1. The Best Publication

181. The 2014 Best Publication was first filed at the PCT on August 4, 2012 and published on July 31, 2014. On its face it claims priority to U.S. Provisional Patent Application No. 61/574,601, filed August 5, 2011. However, as discussed below, it is my opinion that the 2014 Best Publication cannot claim priority to the August 2011 Provisional as the provisional is devoid of any teaching to support much of disclosure in the Best Publication, and in particular, to

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

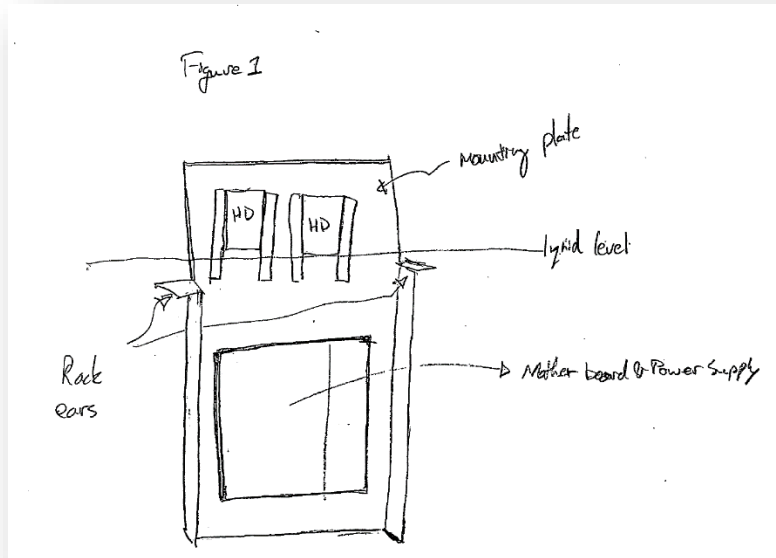
the structures shown in Figure 6 of the Best Publication.

182. The 2014 Best Publication is titled, “Hard Drive Cooling For Fluid Submersion Cooling Systems,” and discloses a system for cooling hard disk drives (“HDDs”) and computing systems by submerging the computing systems in a tank of dielectric liquid coolant and by thermally coupling the HDDs to a heat conductive extension that is partly submerged into the coolant and partly out of the coolant. The HDDs are mounted to the part of the heat conductive extension that is out of the coolant and are cooled through conduction of the heat from the HDDs to the coolant via the heat conductive extension. The system may further use a heat exchanger to cool the dielectric liquid coolant in the tank, and a controller may be used to maintain the dielectric liquid coolant at a specific elevated temperature.

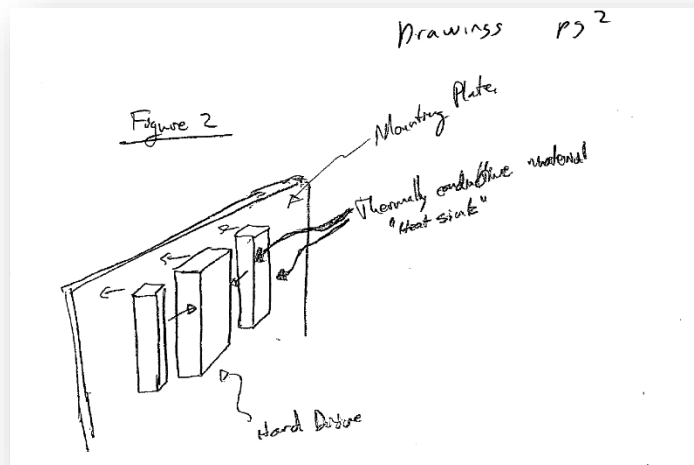
183. The 2014 Best Publication claims priority to the 2011 provisional. However, this provisional application does not disclose or support much of the new subject matter that Mr. Best added when the full utility patent was filed on August 4, 2012. The provisional application makes only a general reference to Application 13/057,881, which is not incorporated by reference, and the full utility application did not claim any priority to it. I have further been informed that a provisional applicant may not properly make a claim of priority to a prior application. Additionally, the Best ‘463 Patent matured from the 13/057,881 utility application, and the Best ‘463 Patent was considered by the patent examiner during the prosecution history of the ‘457 Patent. As a result, I give no weight to the Best 2011 Provisional making a general reference to the ‘881 application (matured into the Best ‘463 Patent).

184. The 2011 Best Provisional is directed to extracting heat from a Hard Disk Drive (“HDD” while at the same time keeping the HDD out of the cooling liquid. Figure 1 shows a construction where the HDDs are mounted above the fluid level on a mounting plate, such that the HDDs remain dry. The mounting plate is attached to a frame that holds the HDD above the fluid level, and other heat-generating electronics can be mounted to the frame, so they are immersed in the fluid. The frame attaches to the tank using the tank’s rack ears.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER



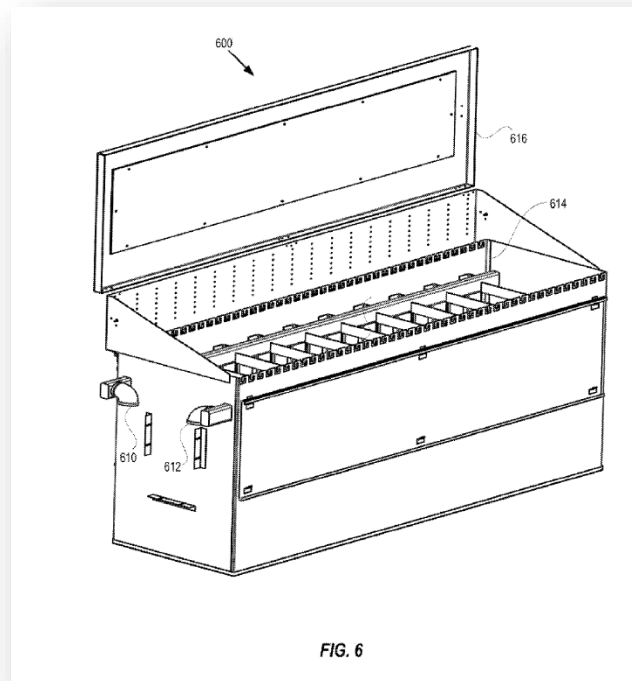
185. Fig. 2 shows that heat sinks can be mounted to the HDDs, and then thermally coupled to the mounting plate. Provided the mounting plate is also thermally conductive, then heat from the HDDs can be dissipated into the fluid. Figures 3 and 4 illustrate other ways to attach heatsinks to HDDs and to the mounting plate.



186. Nothing in the 2011 Best Provisional refers to any fluid flow, any cooling circulation, any pumps, any weirs, any plenums, any control systems, any uniform fluid flow, any pressure manifold, any suction manifold, any nozzles or any velocity augmentation

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

devices. As such it is my opinion that the 2011 Best Provisional does not support the substantial new matter added to The Best Publication, including the structures illustrated and described with reference to Fig. 6 (duplicated below). As a consequence, The 2014 Best Publication can only be prior art after its PCT filing date of August 4, 2012.



187. The earliest priority date available to this publication is August 4, 2012, which is the date of filing of this application pursuant to Pre-AIA 35 U.S.C. § 102(e).

188. The priority date of August 4, 2012, for the 2014 Best Publication is after the conception date of the '457 Patent, and therefore is not prior art under Pre-AIA 35 U.S.C. § 102(e).

C. June 7, 2013, As The Priority Date

189. No additional references added.

D. December 13, 2013, as the Priority Date

190. No additional references added.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

XII. ANALYSIS OF CLAIM 1 UNDER 35 U.S.C. § 102. (ANTICIPATION)

191. At paragraph 240 in Dr. Ortega's Opening Report, he asserts that four references can be evaluated to anticipate the '457 Patent under 35 U.S.C. § 102. These are: (1) the GRC GEN 1 tank (he refers to this as the "Best Tank"); (2) the Best '463 Patent; (3) the Best '914 Patent; and (4) the Best Publication. Dr. Ortega acknowledges that Best '463 Patent and Best '914 Patent have a common disclosure, so are evaluated the same way, which I agree with. However, he also asserts that the GRC GEN 1 Tank is an embodiment of the tank disclosed in the Best Publication. First, this is factually not true as the tanks are different, which I have generally discussed above, and will discuss further below regarding anticipation.

192. Second, provided that Midas is able to prove its March 14, 2012, date of invention, the 2014 Best Publication is not prior art, and cannot be used to bolster the deficient disclosure of the GRC GEN 1 tank.

A. GRC GEN 1 Tank

193. This analysis assumes a March 14, 2012, invention date. As a result, the 2014 Best Publication is not prior art and cannot be used to extend or modify the disclosure of the GRC GEN 1 Tank itself. For this section, any teaching or use by Dr. Ortega of the 2014 Best Publication is ignored. I address the deficiency in the disclosures of the 2014 Best Publication in a section below.

i. An appliance immersion cooling system:

194. To the extent this preamble is determined to be limiting, I find the GRC GEN 1 Tank is an appliance immersion cooling system. However, as discussed below, the GRC GEN 1 Tank fails to disclose several limitations of claim 1, and therefore the GRC GEN 1 Tank is incapable of anticipating claim 1 under 35 U.S.C. § 102.

ii. a tank adapted to immerse in a dielectric fluid a plurality of electrical appliances, each in a respective appliance slot distributed vertically along, and extending transverse to, a long wall of the tank:

195. The GRC GEN 1 tank has this limitation. But as discussed below, the GRC GEN

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

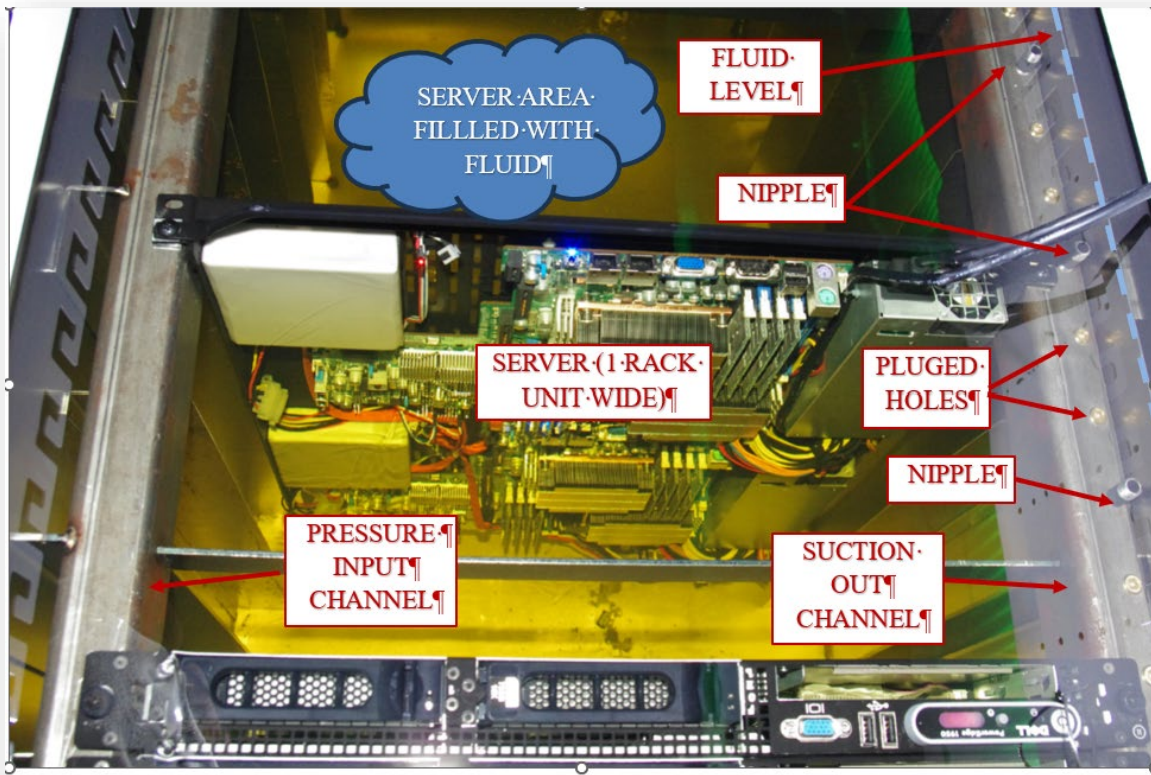
1 Tank fails to disclose key structural components of the tank and immersion system, and therefore the GRC GEN 1 Tank is incapable of anticipating claim 1 under 35 U.S.C. § 102.

iii. a weir, integrated horizontally into the long wall of the tank adjacent to all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot.

196. The GRC GEN 1 Tank does not disclose a weir, integrated into the long wall of the tank, as set forth in claim 1. Instead, the GRC GEN 1 Tank used a suction manifold to suction dielectric fluid from the tank. The suction manifold was fully immersed in the dielectric fluid and had a series of holes or pipes on its top surface that used negative pressure to suction fluid from the tank. The negative pressure in the suction manifold was generated by the suction side of the coolant pump of the immersion cooling system. If the fluid level in the tank lowered sufficiently to be level with, or expose, the suction holes, or pipes, the pump would suck air into the suction manifold. Air entering the coolant circulation or piping system causes a failure situation of the pump referred to as “cavitation” and can seriously damage a pump. Accordingly, the only way in which the holes or pipes of the suction manifold could be level with the dielectric fluid, or exposed above the fluid, is if the immersion cooling system were in a failure mode where the pump was cavitating.

197. Below is a picture of the suction manifold, referred to here as the **SUCTION OUT CHANNEL**, for the GRC GEN 1 Tank. As can be seen, the **SUCTION OUT CHANNEL** is a rectangular channel with holes in its top surface extending the length of the channel. There is one hole for each appliance unit the tank is intended to support. It is my understanding that the GRC GEN 1 Tank was sized as a 42U tank, so there would be about 42 holes on the top surface of the **SUCTION OUT CHANNEL**. In every third hole is a **NIPPLE** that is inserted into the hole, and extends upward into the coolant, but remains well submerged. The two holes between each **NIPPLE** are plugged, such that no fluid can flow through them.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER



198. The **SUCTION OUT CHANNEL** is positioned against one sidewall of the tank, and although it is set in the upper portion of the tank, it must be set low enough that the top of each **NIPPLE** is maintained well below the **FLUID LEVEL**. If the fluid level gets too low, the suction side of the pump will draw air into the circulation system, which, as previously described, is referred to as “cavitation.”

199. The pressure manifold, referred to here as the **PRESSURE INPUT CHANNEL**, is on the opposite tank wall, and is also fully immersed in the fluid. It has holes in its bottom surface where fluid is injected into the tank.

200. “Weir” has an agreed construction of “an overflow structure or barrier that determines the level of liquid.” The structures of the GRC GEN 1 Tank do not meet this limitation, as the suction manifold/hole/pipe structure does not form an overflow structure as the fluid is suctioned into the manifold/hole/pipe structure under the negative pressure created by the suction side of the pump. Further, the manifold/hole/pipe structure is not a barrier, as it enables

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

fluid flow not by its vertical position in the fluid, but by the intensity of the negative pressure generated by the pump. The negative pressure draws fluid from the tank through the **NIPPLES** and into the **SUCTION OUT CHANNEL**. In this way, the positioning of the **SUCTION OUT CHANNEL** structure does not determine the level of the liquid in the tank, but it is the action of the pump that determines the rate at which fluid is extracted from the tank. I also note that the express language of claim 1 requires an overflow lip, so the agreed construction for “weir” that includes the “barrier” language will not affect claim 1.

201. Although the GRC GEN 1 Tank appears to generally have its **SUCTION OUT CHANNEL** structure integrated horizontally into the long wall of the tank adjacent to all appliance slots, the **SUCTION OUT CHANNEL** structure of the GRC GEN 1 Tank is incapable of having the overflow lip that is adapted as set forth in claim 1. It is my understanding that to be an overflow lip would require two things. First, the structure needs to provide a “lip,” which is commonly understood to be the edge of an opening, and second, there would need to be a gravity induced flow of liquid over that lip. The GRC GEN 1 Tank has no lip (edge of an opening) that has a gravity induced flow. Instead, the flow into the **SUCTION OUT CHANNEL** is through a **NIPPLE** and set by the negative pressure provided by the pump.

202. As the GRC GEN 1 Tank does not have an overflow lip, it follows that the GRC GEN 1 Tank cannot have “an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid.” In addition, the spacing of the **NIPPLES** in the suction manifold of the GRC GEN 1 tank are set quite far apart compared to the spacing of the appliances (3-U apart). The separation of the **NIPPLES** would cause a flow imbalance that would result in the coolant farther from the holes and pipes being warmer, and the fluid closest to the holes and pipes of the suction manifold being cooler. Also, the negative pressure at the **NIPPLES** applies tangential and axial forces on the coolant that cause the coolant to swirl as it enters the manifold. The swirling motion increases the flow distance of the coolant exiting the space between two appliances located between holes or pipes as compared to the coolant exiting the space between two appliances adjacent to a hole or pipe. The swirling effect of the coolant as it enters the manifolds

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

is contrary to the claim requirement of uniform coolant recovery. Although the level of non-uniformity of the coolant flow would be difficult to accurately assess, I can confidently say that the claimed weir structure would provide improved uniformity as compared to the manifold/hole/pipe structure of the GRC GEN 1 Tank.

iv. a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip of the weir and adapted to receive the dielectric fluid as it flows over the weir.

203. As discussed above, the GRC GEN 1 Tank does not have a weir with an overflow lip that enables a gravity induced flow of the dielectric fluid. As a result, the GRC GEN 1 Tanks does not disclose the “overflow lip of the weir”, and therefore the GRC GEN 1 Tank can have no structure that is vertically positioned beneath, nor adapted to receive the heated dielectric fluid “as it flows over the weir.” As the claimed fluid recovery reservoir is required to receive the dielectric fluid that flows over the overflow lip of the weir, the GRC GEN 1 Tank cannot disclose a fluid recovery reservoir as claimed.

204. Dr. Ortega asserts that the suction manifold serves as a dielectric fluid recovery reservoir and receives the dielectric fluid as it flows over the nozzles. (Para. 277). This is contrary to the operation of the suction manifold, which relies on suction to operate, as opposed to a weir, which is defined as a gravity fed device. Because the fluid entering the suction manifold is not gravity fed, the interior of the suction manifold does not meet the claim limitation of a fluid recovery reservoir positioned vertically beneath the overflow lip of the weir.

205. For these reasons, the GRC GEN 1 Tank is incapable of anticipating claim 1 under 35 U.S.C. § 102.

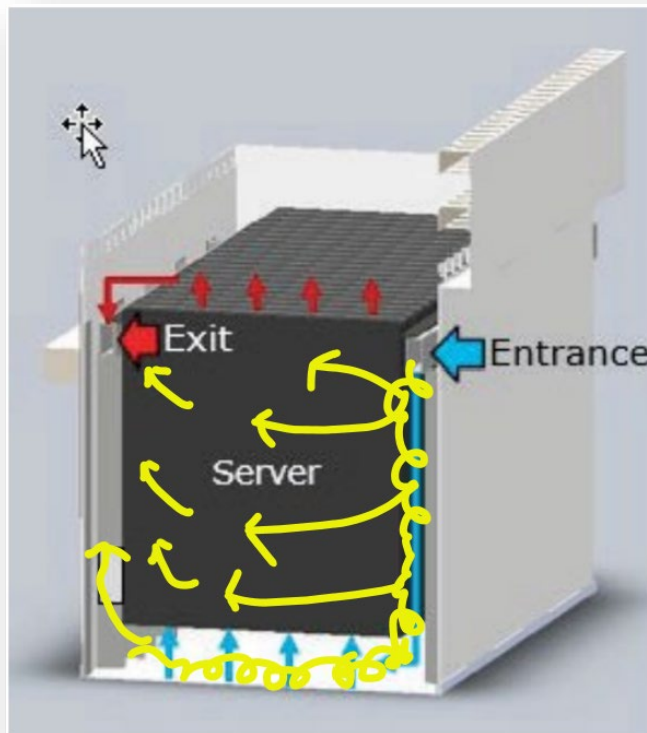
v. a primary circulation facility adapted to circulate the dielectric fluid through the tank,

206. The GRC GEN 1 Tank has a primary circulation facility that circulates dielectric fluid through the tank. But as discussed in this section, the GRC GEN 1 Tank fails to disclose key structural components of the tank and immersion system (such as the plenum and weir), and therefore the GRC GEN 1 Tank is incapable of anticipating claim 1 under 35 U.S.C. § 102.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

vi. a plenum, positioned adjacent to the bottom of the tank, adapted to dispense the dielectric fluid substantially uniformly upwardly through each appliance slot.

207. The GRC GEN 1 Tank does not have a plenum as claimed in its primary circulation facility. Instead, the GRC GEN 1 Tank has an elongated pressure manifold that is set near the top of the tank, referred to as a **PRESSURE INPUT CHANNEL** in the picture above, with holes or injectors in the bottom that flow fluid into the tank. These holes or injectors push the dielectric coolant toward the bottom of the tank, but as described above, due to the turbulent flow of the coolant, as it exits the injectors, and multiple flow paths available to the coolant, the fluid mixes and flows in multiple directions. As illustrated in the figure below, some fluid will flow directly between appliances, some fluid will flow under the appliances and be drawn to the



suction manifold, and some will flow upward as it moves through the appliances (generally described by the yellow “squiggles” and arrows). It is my opinion that only a small portion of the injected fluid would be routed within the tank in a way that moved the fluid from the bottom of the tank upward through the appliances.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

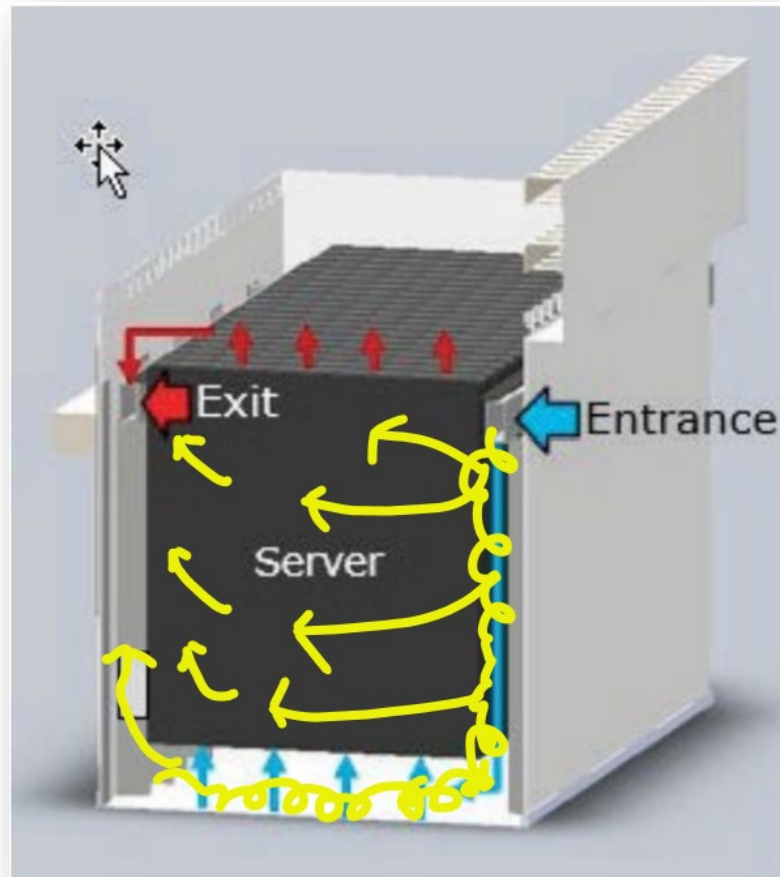
208. “Plenum” has an agreed construction of “a structure for dispensing liquid.” However, it is my understanding that claims must be read as a whole, and it is therefore inappropriate to parse a limitation of a claim into individual words. Here, the GRC GEN 1 Tank uses an input manifold to inject fluid into the tank, which I would consider a structure for dispensing liquid into the tank, but the input manifold fails to disclose key structures as claimed, as discussed below.

209. The input manifold of the GRC GEN 1 Tank is not positioned adjacent to the bottom of the tank. Instead, it is located adjacent to the top of the tank. Dr. Ortega reached the rather surprising conclusion that “[T]he chamber below the server and adjacent the bottom of the tank is a plenum as claimed...” (Exhibit D3 at page 86). The overly simplistic diagram he uses not only expressly disproves his statement, but it also completely misrepresents the actual flow of fluid in the tank. First, as agreed, a plenum is a structure that dispenses liquid. As expressly shown in the diagram, the dielectric fluid has an “Entrance” into the inlet manifold and is then “dispensed” in a downward direction along the side of the tank and the appliances. Nothing is “dispensed” from the area adjacent to the bottom of the tank. Dr. Ortega calls the area below the servers a “chamber”, which is commonly understood to be an enclosed space or enclosed cavity. However, the volume below the servers is not an enclosed space but is a continuation of the whole tank. As illustrated, the tank is open above the servers, on the injection manifold side of the servers, on the suction manifold side of the servers, and below the servers. To isolate the space below the servers as a “chamber” is disingenuous, at best, but to then assert that such an open and undefinable space is a plenum that distributes liquid is absurd. The space that Dr. Ortega defined as the plenum chamber is nothing more than a continuation of the volume within the tank.

210. As illustrated below, the pressure manifold of the GRC GEN 1 Tank would not provide for a uniform flow of fluid upwardly through the appliance slots. Instead, the cooled dielectric fluid injected into the warmer fluid at the top of the tank would create turbulence and widespread mixing (generally depicted by the yellow “squiggles”). This turbulence and the

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

pressure from the pressure manifold would also push fluid between the appliance slots from the side (generally depicted by the yellow arrows). This construction would be highly inefficient,



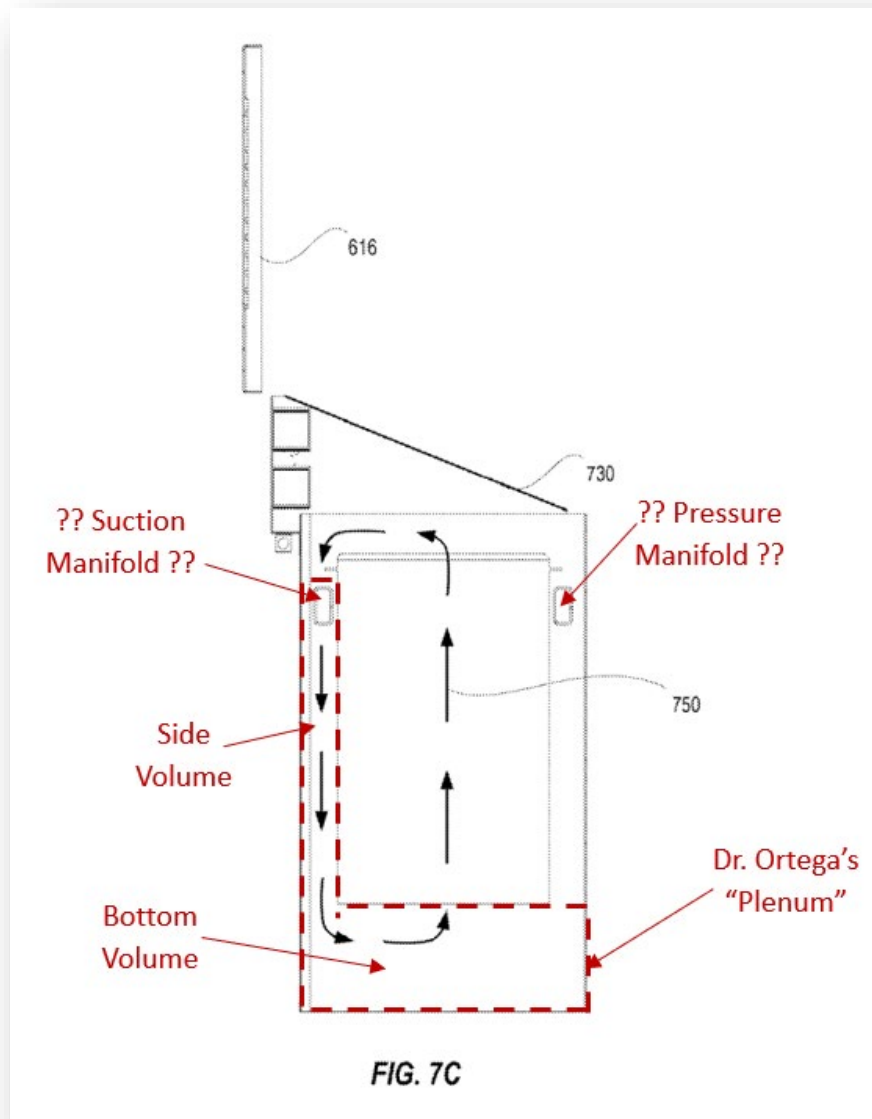
and result in only a limited amount (if any) of the cooled coolant making it to the bottom of the tank. Note that the figure below is a cross-section of the tank, so the flow generally depicted by the yellow arrows would occur between each of the electrical appliances.

211. Dr. Ortega also relies heavily on the 2014 Best Publication accurately describing the technical aspects of the GRC GEN 1 tank ("Further, the Best Tank embodies the Best Publication."). As discussed in a previous section, provided Midas is able to prove March 14, 2012, as the date of invention, the 2014 Best Publication is not a prior art reference and cannot be used to bolster the GRC GEN 1 Tank explanation.

212. Dr. Ortega's entire description of fluid flow in the GRC GEN 1 Tank is using disclosures from the Best Publication. For example, FIG.7C, which Dr. Ortega uses to illustrate

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

fluid flow in the GRC GEN 1 Tank, is actually for the tank depicted in the Best Publication. I have annotated FIG. 7C to show in a dotted red line what Dr. Ortega believes is a “plenum” as claimed in claim 1. It is my opinion that a top-oriented pressure channel, nozzles, a side volume, and a bottom volume under the servers, cannot be a plenum as claimed.



213. Further, comparing Fig. 6 of the 2014 Best Publication with Fig. 7C of the same publication shows the coolant circulating down past the Suction Manifold 720, which is connected to the coolant outlet 610, and up through the appliances. (See 2014 Best Publication [0069]). It is not possible for the coolant to flow as indicated by circular arrow 750 because there

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

is no force or pressure moving the coolant in that direction. Instead, the negative pressure of the suction manifold would draw the fluid towards and into the manifold. Even if the pressure manifold 710 is located on the left side of the tank shown in Fig. 7C and the Suction Manifold 720 on the right side, the coolant would not flow as indicated by circular arrow 750. The negative pressure of the suction manifold 720 would have a significant impact on the coolant flow direction and cause a flow pattern more accurately depicted by the yellow “squiggles” in the picture above.

214. Yet another example of an erroneous explanation from the 2014 Best Publication can be found in [0072]. The paragraph refers to a “baffle 730 that is integrated in the suction manifold 720 is shown” in Fig. 7C. Referring to Fig. 7C, and comparing it to tank 600, it appears the leader line for 730 is pointing to the top edge of the tank. The “baffle” is not associated with either manifold and appears to be well above the computing systems 230 and HDD sleds 240, and well above the circular arrow 750 that represents the proposed coolant flow.

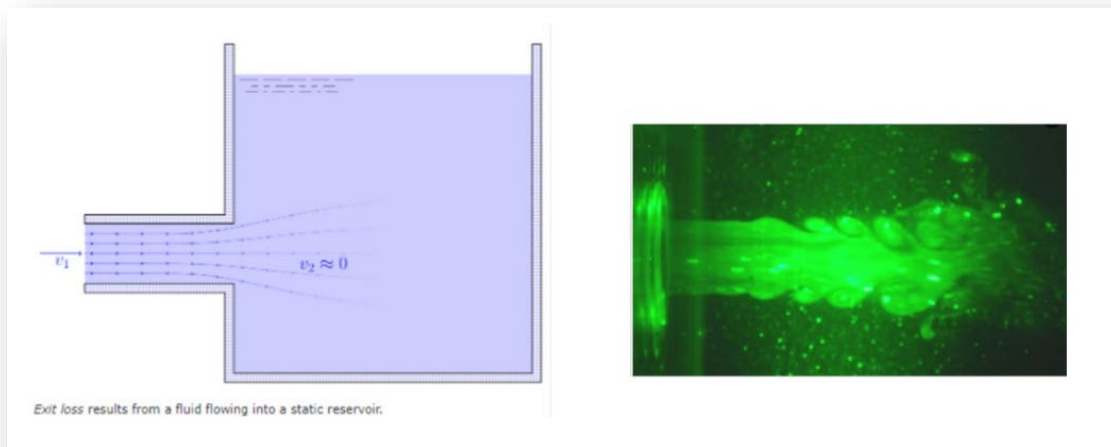
215. The paragraph goes on to explain that “Baffle 730 may be used to prevent the dielectric liquid coolant from going around the computing system in the earlier mentioned coolant flow.” While a baffle can be designed to prevent the liquid coolant from flowing in a particular area, “going around the computing system” was an integral part of the proposed coolant flow path indicated by circular arrow 750. Yet no alternative flow pattern was presented, only “In any case, circular arrow 750 shows one possible flow direction of the dielectric liquid coolant in the tank 600.” As described previously, it is my opinion that circular arrow 750 proposes a flow path that is at best improbable, and more likely, impossible. Preventing the coolant from “going around the computing system” would only make the flow path more improbable.

216. The lack of the author’s understanding of coolant flow is further demonstrated in the 2014 Best Publication in paragraph [0071]. The paragraph states “as the dielectric liquid coolant comes out of the velocity augmentation devices along the length of the pressure manifold 710, the movement or flow of the coolant accelerates.” I disagree. It is well understood in fluid

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

dynamics that as a fluid comes out of a velocity augmentation device, such as a nozzle, and enters a substantially larger volume filled with the same or similar fluid, such as tank 600, the fluid DECELERATES. This is due to the inertia of the faster moving fluid transferring to the slower moving bulk fluid through viscous forces.²⁰

217. While the momentum transfer from the deceleration of the coolant exiting the velocity augmentation devices would result in a slight increase in the local velocity of the bulk coolant, I disagree that the momentum transfer would improve the direction of the flow of the coolant. An example of flow exiting a velocity augmentation device is shown in Figure 8 of Dr. Ortega's Opening Report, repeated here: As can be seen in the picture on the right side of Figure 8, there is almost no bulk movement of fluid resulting from the injection of the fast moving fluid, and the fast moving fluid stream quickly dissipates into a mixing and churning cloud of fluid.



vii. a secondary fluid circulation facility adapted to extract heat from the dielectric fluid circulating in the primary circulation facility, and to dissipate to the environment the heat so extracted; and

218. The GRC GEN 1 tank has a secondary circulation facility. As installed at the Midas Networks facility, the GRC GEN 1 tank cooled the dielectric fluid using an evaporative cooler. This evaporative cooler dispensed heat to the environment that had been extracted from

²⁰ Fluid Dynamics, Daily, James and Harleman, Donald, Addison-Wesley, 1966

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

the primary circulation facility. However, as discussed in this section, the GRC GEN 1 Tank fails to disclose key structural components of the tank and immersion system (such as the plenum and weir), and therefore the GRC GEN 1 Tank is incapable of anticipating claim 1 under 35 U.S.C. § 102.

viii. a control facility adapted to coordinate the operation of the primary and secondary fluid circulation facilities as a function of the temperature of the dielectric fluid in the tank.

219. The GRC GEN 1 tank has a control facility that controls operation as a function of the temperature of the dielectric fluid. But as discussed in this section, the GRC GEN 1 Tank fails to disclose key structural components of the tank and immersion system (such as the plenum and weir), and therefore the GRC GEN 1 Tank is incapable of anticipating claim 1 under 35 U.S.C. § 102.

B. The Best ‘463 Patent

220. The application that issued as the Best ‘463 Patent was cited and used by the Examiner during prosecution of the ‘457 Patent.

i. An appliance immersion cooling system:

221. To the extent this preamble is determined to be limiting, I find the Best ‘463 Patent is an appliance immersion cooling system. However, as discussed below, the Best ‘463 Patent fails to disclose several limitations of claim 1, and therefore the Best ‘463 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

ii. a tank adapted to immerse in a dielectric fluid a plurality of electrical appliances, each in a respective appliance slot distributed vertically along, and extending transverse to, a long wall of the tank, the tank comprising:

222. The Best ‘463 Patent has this limitation. But as discussed below, the Best ‘463 Patent fails to disclose key structural components of the tank and immersion system, and therefore the Best ‘463 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

iii. a weir, integrated horizontally into the long wall of the tank adjacent to all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot.

223. The Best '463 Patent discloses no structure which can be identified as a weir as claimed. Instead, the Best '463 Patent discloses using a suction pipe to suction heated dielectric fluid from the tank. The suction pipe must remain fully immersed in the dielectric fluid because a pump creates a negative pressure to suction the fluid from the tank. As shown in Figure 1A and Figure 2 of the Best '463 Patent, the negative pressure in the suction pipe is generated by a pump. If the fluid level in the tank lowered sufficiently to be at the same level as the suction pipe, the pump would suck air into the suction manifold, which, as described above, causes a failure situation referred to as “cavitation.” Accordingly, the only way in which the coolant could be level with the suction pipe would be if the tank were in a failure mode where the suction system was cavitating. Fig. 3 from the Best '463 Patent is duplicated below and shows the outlet pipe 450 installed onto the sidewall of the tank 410. It does not extend along the long wall of the tank.

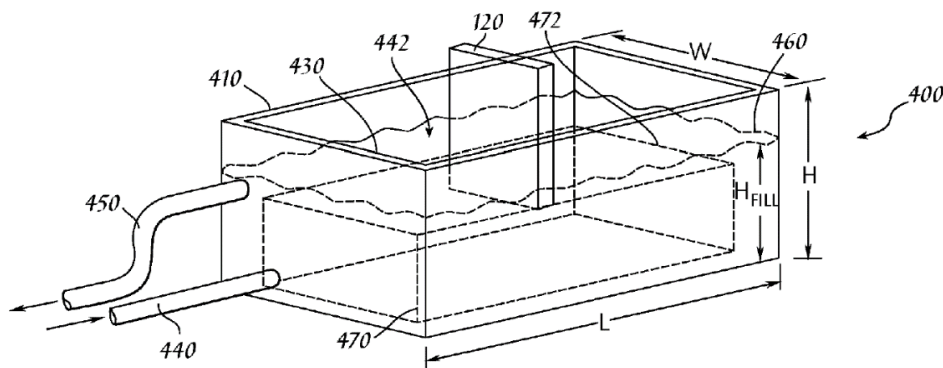


Fig. 3

224. “Weir” has an agreed construction of “an overflow structure or barrier that

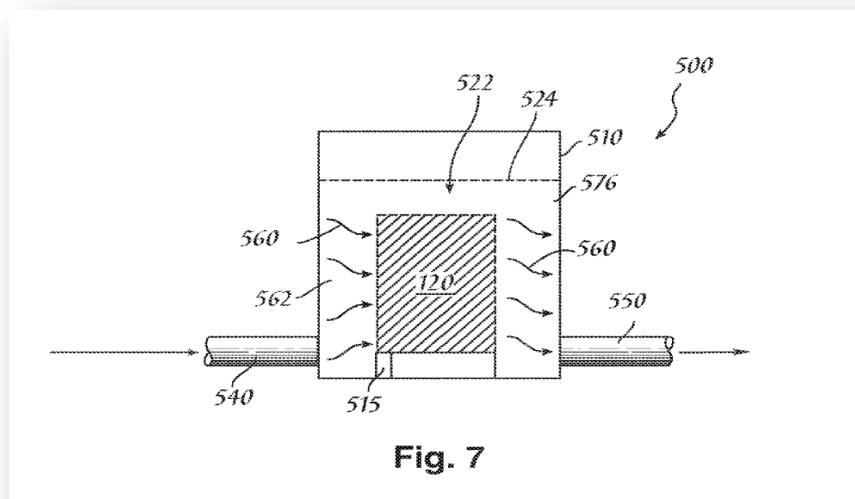
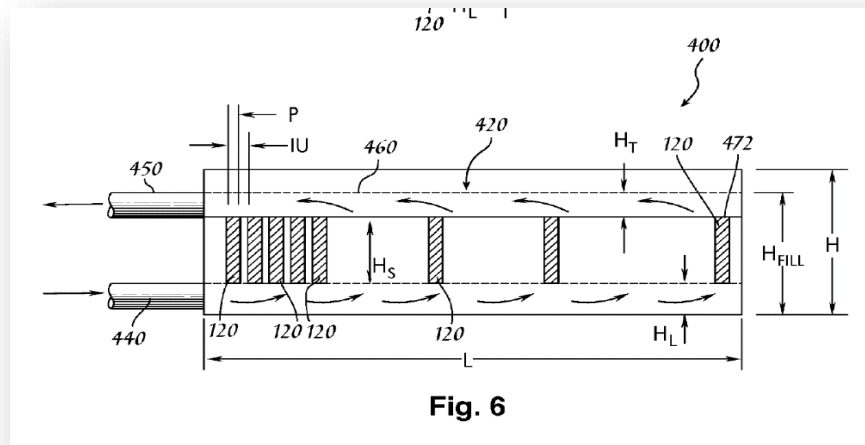
CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

determines the level of liquid.” The structures of the Best ‘463 Patent do not meet this limitation, as the suction pipe structure does not form an overflow structure as the fluid is suctioned into the pipe structure under the negative pressure created by the pump. Further, the suction pipe structure is not a barrier, as it enables fluid flow not by its vertical position in the tank, but by the intensity of the negative pressure drawing fluid from the tank. In this way, the positioning of the suction pipe structure does not determine the level of the liquid in the tank, but it is the action of the pump that determines the rate at which fluid is extracted from the tank. I also note that the express language of claim 1 requires an overflow lip, so the agreed construction for weir that includes the “barrier” language will not affect claim 1.

225. The Best ‘463 Patent does not have a weir integrated horizontally into the long wall of the tank adjacent to all appliance slots. Instead, the suction pipe of the Best ‘463 Patent is mounted to the side wall of the tank. No structure extends along the long wall or is integrated into the long wall of the tank of the Best ‘463 Patent. As such, the Best ‘463 Patent is incapable of having an overflow lip. It is my understanding that to be an overflow lip would require two things. First, the structure needs to provide a “lip,” which is commonly understood to be the edge of an opening, and second, there would need to be a gravity induced flow of liquid over that lip. The Best ‘463 Patent has no lip (edge of an opening) that has a gravity induced flow. Instead, the flow into the suction pipe structure is set by the negative pressure determined by the pump.

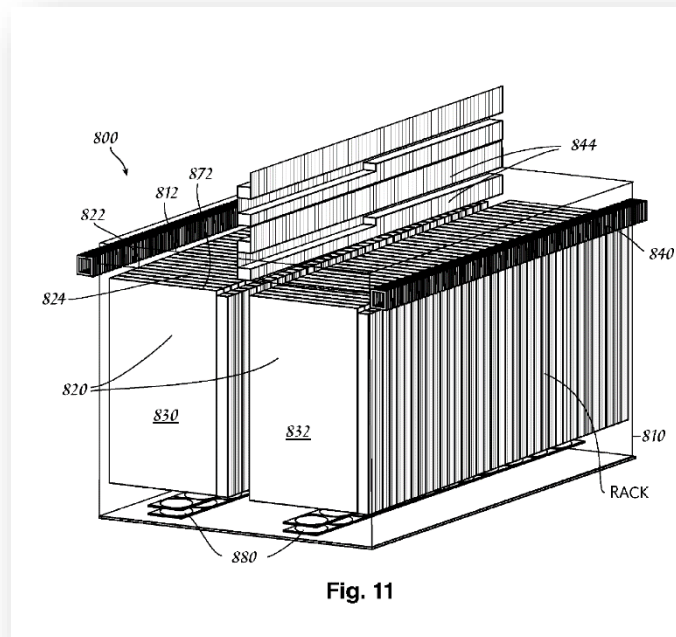
CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

226. As the Best '463 Patent does not have an overflow lip, it follows that the Best '463 Patent cannot have “an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid”. Indeed, the fluid drawn into the suction pipe does not create a uniform flow, as can be seen in Fig. 6 and Fig 7 of the Best '463 Patent, below. Fig. 6 is a side elevation of Fig. 3, and Fig. 7 is an end elevation of a different embodiment showing the inlet pipe 540 and output pipe 550 both disposed lower in the tank. As illustrated, the flow rates would be highest, and correspondingly the coolant temperatures lowest, for appliances near the suction pipe, and flow rates would be lower, and correspondingly the coolant temperatures higher, as appliances are farther removed from the suction pipe.



CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

227. The non-uniformity of the coolant flow in the Best '463 Patent is further illustrated in Fig. 11, which shows that tank 810 has such nonuniform flow that fans 880 are installed to more evenly direct fluid flow in the tank.



228. For the reasons stated in this section the Best '463 Patent does not disclose a weir, integrated horizontally into the long wall of the tank adjacent to all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot and therefore the Best '463 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

i. a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip of the weir and adapted to receive the dielectric fluid as it flows over the weir.

229. As discussed above, the Best '463 Patent does not have a weir with an overflow lip that enables a gravity fed flow of the heated dielectric fluid. As a result, the Best '463 Patent does not disclose the “overflow lip of the weir,” and therefore the Best '463 Patent can have no structure that is adapted to receive the dielectric fluid “as it flows over the weir.” As the claimed fluid recovery reservoir is required to receive the dielectric fluid that flows over the overflow lip

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

of the weir, the Best '463 Patent cannot disclose a fluid recovery reservoir as claimed, and therefore the Best '463 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

ii. a primary circulation facility adapted to circulate the dielectric fluid through the tank:

230. The Best '463 Patent has a primary circulation facility that circulates dielectric fluid through the tank. But as discussed in this section, the Best '463 Patent fails to disclose key structural components of the tank and immersion system (such as the plenum and weir), and therefore the Best '463 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

iii. a plenum, positioned adjacent to the bottom of the tank, adapted to dispense the dielectric fluid substantially uniformly upwardly through each appliance slot.

231. The Best '463 Patent does not have a plenum as claimed in its primary circulation facility. Instead, the Best '463 Patent has an input pipe that comes in from an end of the tank, and as illustrated in the figures 6 and 7 shown above, some fluid will flow between appliances, some fluid will flow under the appliances, and some will flow upward between the appliances, before being drawn to the output pipe. Further, the fluid flow in the Best '463 Patent enables substantial mixing of the cooled fluid with the heated fluid, as illustrated in Fig. 14, and described at Best '463 Patent 20:15-27.

232. "Plenum" has an agreed construction of "a structure for dispensing liquid." However, it is my understanding that claims must be read as a whole, and it is therefore inappropriate to parse a limitation of a claim into individual words. Here, the Best '463 Patent uses an input pipe to inject fluid into the tank, and I would consider the input pipe a structure for dispensing liquid into the tank. However, the input pipe fails to disclose key structures as claimed.

233. The Best '463 Patent has such poor fluid flow characteristics that it contemplates adding "fluid velocity augmentation devices" to increase the mixing of the dielectric fluid and increase the flow of the dielectric through the plurality of servers. (The Best '463 Patent 20:3-9) As illustrated, these fluid augmentation devices may be fans (880) at the bottom of the tank, or in

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

other cases may include nozzles in the coolant inlet piping. These structures can be used to increase the velocity of the fluid, but do not dispense the dielectric fluid substantially uniformly upward through each appliance slot.

234. For the reasons stated in this section the Best '463 Patent does not disclose a plenum, positioned adjacent to the bottom of the tank, adapted to dispense the dielectric fluid substantially uniformly upwardly through each appliance slot and therefore the Best '463 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

iv. a secondary fluid circulation facility adapted to extract heat from the dielectric fluid circulating in the primary circulation facility, and to dissipate to the environment the heat so extracted; and

235. The Best '463 Patent has a secondary circulation facility to dissipate heat to the environment that was extracted from the primary circulation facility. But as discussed in this section, the Best '463 Patent fails to disclose key structural components of the tank and immersion system (such as the plenum and weir), and therefore the Best '463 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

v. a control facility adapted to coordinate the operation of the primary and secondary fluid circulation facilities as a function of the temperature of the dielectric fluid in the tank.

236. The Best '463 Patent has a control facility that controls operation as a function of the temperature of the dielectric fluid. But as discussed in this section, the Best '463 Patent fails to disclose key structural components of the tank and immersion system (such as the plenum and weir), and therefore the Best '463 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

C. The Best '914 Patent

237. The Best '914 Patent is a continuation of the Best '463 Patent, and therefore has the same disclosure as in the application that issued as the Best '463 Patent, which was cited and used by the Examiner during prosecution of the '457 patent. If anything new was added by the

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

Best '914 Patent over what was disclosed in the Best '463 Patent, then the new material would be considered new matter and not be considered prior art to the '457 Patent. As a result, the same analysis as was done for the Best '463 Patent applies to the 'Best '914 Patent, as acknowledged by Dr. Ortega in para. 240 of his Opening Report. To reduce duplication, the analysis done for the Best '463 Patent is incorporated herein in its entirety as if fully set forth.

D. The Best Publication

238. As previously described, the 2014 Best Publication is only a prior art reference if Midas is not able to maintain March 14, 2012, as the date of invention. In this way, the discussion below only applies if the effective filing date of the '457 Patent is determined to be after August 4, 2012 (PCT filing date for the 2014 Best Publication).

239. Dr. Ortega has asserted in paragraph 240 that the GRC GEN 1 Tank is an embodiment of the 2014 Best Publication tank. First, Christiaan Best submitted a declaration that stated GRC sold Midas Networks four GRC GEN 1 Tanks in a sales contract dated August 4, 2010. It is also my understanding that the 2014 Best Publication first showed the Fig. 6 tank in its PCT filing on August 4, 2012, two full years after sale of the GRC GEN 1 Tanks to Midas. If the GRC GEN 1 Tank is an embodiment of the 2014 Best Publication as Dr. Ortega asserts, then I have been informed that the filing of the 2014 Best Publication would have violated the statutory on-sale bar in U.S. Patent Law. Although not conclusive, I find that GRC's filing the 2014 Best Publication to be strong circumstantial evidence that GRC did not believe that the GRC GEN 1 Tank, that Midas Networks purchased on August 4, 2010, was an embodiment of the 2014 Best Publication.

240. Even Mr. Best does not go so far in his declaration as to say the GRC GEN 1 tanks were an embodiment of the 2014 Best Publication, simply saying that the GRC GEN 1 Tanks were "visually similar to the tanks outlined in Figure 6" in The Best Publication.

241. It is my opinion that there is not sufficient information for a reasonable expert to conclude that the GRC GEN 1 Tanks are an embodiment of the disclosures of the Best Publication.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

i. An appliance immersion cooling system comprising:

242. To the extent this preamble is determined to be limiting, I find the 2014 Best Publication tank is an appliance immersion cooling system. However, as discussed below, the 2014 Best Publication tank fails to disclose several limitations of claim 1, and therefore the 2014 Best Publication tank is incapable of anticipating claim 1 under 35 U.S.C. § 102.

ii. a tank adapted to immerse in a dielectric fluid a plurality of electrical appliances, each in a respective appliance slot distributed vertically along, and extending transverse to, a long wall of the tank, the tank comprising:

243. The 2014 Best Publication tank has this limitation. But as discussed below, the 2014 Best Publication fails to disclose key structural components of the tank and immersion system, and therefore the 2014 Best Publication is incapable of anticipating claim 1 under 35 U.S.C. § 102.

iii. a weir, integrated horizontally into the long wall of the tank adjacent to all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot.

244. 2014 Best Publication does not disclose a weir as set forth in claim 1. Instead, the 2014 Best Publication tank used a Suction Manifold to remove heated dielectric fluid from the tank. The Suction Manifold was fully immersed in the dielectric fluid and had a series of holes or pipes on its top surface that used a negative pressure to remove heated fluid from the tank. The negative pressure in the suction manifold was generated by a pump. As described previously, if the fluid level in the tank lowered sufficiently to be level with, or expose, the suction holes, or pipes, the pump would suck air into the suction manifold, which causes a failure situation of the pump referred to as “cavitation.” Accordingly, the only way in which the manifold, suction holes, or suction pipes, could be level with the dielectric fluid, or exposed, is if the immersion cooling system were in a failure mode where the pump was cavitating.

245. “Weir” has an agreed construction of “an overflow structure or barrier that determines the level of liquid”. The structures of the 2014 Best Publication tank do not meet this

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

limitation, as the suction manifold/hole/pipe structure does not form an overflow structure because the fluid flows into the suction manifold/hole/pipe structure under the negative pressure created by the pump. Further, the manifold/hole/pipe structure is not a barrier, as it enables fluid flow not by its vertical position in the fluid, but by the intensity of the negative pressure generated by the pump. The negative pressure draws fluid from the tank into the suction manifold. In this way, the positioning of the manifold/hole/pipe structure does not determine the level of the liquid in the tank, but it is the action of the pump that determines the rate at which fluid is extracted from the tank. I also note that the express language of claim 1 requires an overflow lip, so the agreed construction for weir that includes the “barrier” language will not affect claim 1.

246. Although the 2014 Best Publication tank appears to generally have its manifold/hole/pipe structure integrated horizontally into the long wall of the tank adjacent to all appliance slots, the manifold/hole/pipe structure of the 2014 Best Publication tank is incapable of having the overflow lip that is adapted as set forth in claim 1. It is my understanding that to be an overflow lip would require two things. First, the structure needs to provide a “lip”, which is commonly understood to be the edge of an opening, and second, there would need to be a gravity induced flow of liquid over that lip. The 2014 Best Publication tank has no lip (edge of an opening) that has a gravity induced flow. Instead, the flow into the manifold/hole/pipe structure is set by the negative pressure set by the pump.

247. As the 2014 Best Publication tank does not have an overflow lip, it follows that the 2014 Best Publication tank cannot have “an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid”. In addition, the spacing of the holes and pipes in the suction manifold on the 2014 Best Publication are set quite far apart compared to the spacing of the appliances. The separation of the holes and pipes would cause a flow imbalance that would result in the coolant being farther from the holes and pipes being warmer, and the fluid closest to the holes and pipes of the suction manifold being cooler. Also, the negative pressure at the holes and pipes apply tangential and axial forces on the coolant that cause the coolant to swirl as it

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

enters the manifold. The swirling motion increases the flow distance of the coolant exiting the space between two appliances located between holes or pipes as compared to the coolant exiting the space between two appliances adjacent to a hole or pipe. The swirling effect of the coolant as it enters the manifolds is contrary to the claim requirement of uniform coolant recovery. Although the level of non-uniformity of the coolant flow would be difficult to accurately assess, I can confidently say that the claimed weir structure would provide improved uniformity as compared to the manifold/hole/pipe structure of the 2014 Best Publication tank.

248. Dr. Ortega asserts that the Suction Manifold has a set of nozzles, which would form holes in the Suction Manifold, and thus allow dielectric fluid to flow into the Suction Manifold. According to Dr. Ortega, the nozzles of the Suction Manifold thus serve as a weir or “an overflow structure or barrier that determines the level of liquid.”²¹ However, the Suction Manifold does not act in this way. In order for the Suction Manifold to function, the liquid in the tank had to be significantly higher than the holes on the top of the Suction Manifold.²² Further, the Suction Manifold did not operate in a manner that allowed for uniform recovery of the dielectric fluid. In this way, the Suction Manifold did not act as an overflow structure or barrier.

249. For the reasons stated in this section, the 2014 Best Publication does not disclose a weir, integrated horizontally into the long wall of the tank adjacent to all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot, and therefore the Best ‘463 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

iv. a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip of the weir and adapted to receive the dielectric fluid as it flows over the weir.

250. As discussed above, the 2014 Best Publication does not have a weir with an overflow lip that enables a gravity induced flow of the heated dielectric fluid. As a result, the 2014 Best Publication does not disclose the “overflow lip of the weir”, and therefore the 2014 Best Publication can have no structure that is adapted to receive the heated dielectric fluid “as it

²¹ Opening Expert Report of Dr. Ortega at para. 266

²² Deposition of Christopher Boyd Vol. 1 at 142:4-20

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

flows over the weir.” As the claimed fluid recovery reservoir is required to receive the dielectric fluid that flows over the overflow lip of the weir, the 2014 Best Publication cannot disclose a fluid recovery reservoir as claimed.

251. Dr. Ortega asserts that the Suction Manifold serves as a dielectric fluid recovery reservoir and receives the dielectric fluid as it flows over the nozzles²³. This is contrary to the operation of the Suction Manifold, which relies on negative pressure to operate, as opposed to a weir, which is defined as a gravity fed device. Because the fluid entering the Suction Manifold is not gravity fed, the interior of the Suction Manifold does not meet the claim limitation of a fluid recovery reservoir.

252. For the reasons stated in this section, the 2014 Best Publication does not disclose a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip of the weir and adapted to receive the dielectric fluid as it flows over the weir, and therefore the Best ‘463 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

v. a primary circulation facility adapted to circulate the dielectric fluid through the tank, comprising:

253. The 2014 Best Publication has a primary circulation facility that circulates dielectric fluid through the tank. But as discussed in this section, the 2014 Best Publication fails to disclose key structural components of the tank and immersion system (such as the plenum and weir), and therefore the 2014 Best Publication is incapable of anticipating claim 1 under 35 U.S.C. § 102.

vi. a plenum, positioned adjacent to the bottom of the tank, adapted to dispense the dielectric fluid substantially uniformly upwardly through each appliance slot.

254. The 2014 Best Publication tank does not have a plenum as claimed in its primary circulation facility. Instead, the 2014 Best Publication tank has an elongated pressure manifold that is set near the top of the tank, with holes or injectors in the bottom of the pressure manifold that flow fluid into the tank. These holes or injectors push the dielectric coolant toward the

²³ Opening Expert Report of Dr. Ortega at para. 277

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

bottom of the tank. However, due to the turbulent flow of the coolant as it exits the injectors, and multiple flow paths available to the coolant, the fluid mixes and flows in multiple directions as a function of the pressure differences of each potential flow path. As illustrated in the figure below, some fluid will flow directly between appliances, some fluid will flow under the appliances, and some will flow upward as it moves through the appliances, prior to being drawn into the Suction Manifold. It is my opinion that only a small portion of the injected fluid would be routed within the tank in a way that moved the fluid from the bottom of the tank upward through the appliances. Further, by the time that fluid gets to the bottom of the tank, it is very likely to have mixed with warmer fluid as it descends in the tank due to the turbulent characteristic of the fluid exiting the injectors and the distance between the injectors and the bottom of the tank.

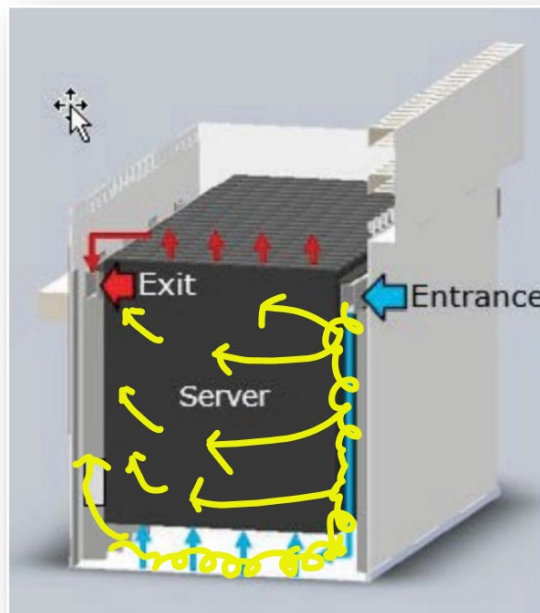
255. “Plenum” has an agreed construction of “a structure for dispensing liquid.” However, it is my understanding that claims must be read as a whole, and it is therefore inappropriate to parse a limitation of a claim into individual words. Here, the 2014 Best Publication tank uses a pressure manifold to inject fluid into the tank, which I would consider a structure for dispensing liquid into the tank, but the pressure manifold fails to disclose the key structures as claimed, as discussed below.

256. The pressure manifold of the 2014 Best Publication tank is not positioned adjacent to the bottom of the tank. Instead, it is located adjacent to the top of the tank. Dr. Ortega reached the rather surprising conclusion that “[T]he chamber below the server and adjacent the bottom of the tank is a plenum as claimed...” (Exhibit D3 at page 86). The overly simplistic diagram he uses not only expressly disproves his statement, but it also completely misrepresents the actual flow of fluid in the tank. First, as agreed, a plenum is a structure that dispenses liquid. As expressly shown in the diagram, the dielectric fluid has an “Entrance” into the inlet manifold and is then “dispensed” in a downward direction along the side of the tank and the appliances. Nothing is “dispensed” from the area adjacent to the bottom of the tank. Dr. Ortega calls the area below the servers a “chamber,” which is commonly understood to be an

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

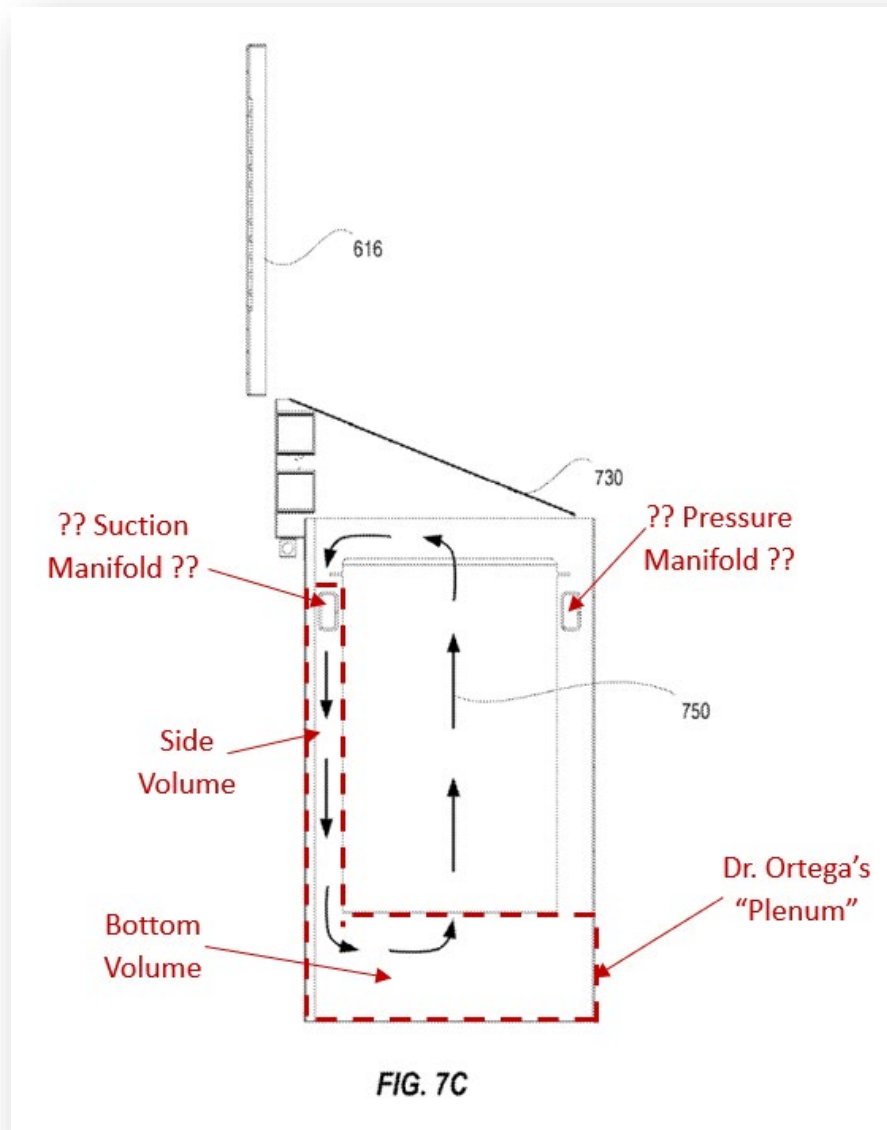
enclosed space or enclosed cavity. However, the volume below the servers is not an enclosed space but is a continuation of the whole tank. As illustrated, the tank is open above the servers, on the injection side of the servers, on the suction side of the servers, and below the servers. To isolate the space below the servers as a “chamber” is disingenuous, at best, but to then assert that such an open and undefinable space is a plenum that dispenses liquid is absurd. The space that Dr. Ortega defined as the plenum chamber is nothing more than a continuation of the volume within the tank where fluid mixing occurs.

257. As illustrated below, the pressure manifold of the 2014 Best Publication tank would not provide for a uniform flow of fluid upwardly through the appliance slots. Instead, the cooled fluid injected into the warmer fluid at the top of the tank would create turbulence and widespread mixing (generally depicted by the yellow “squiggles”). This turbulence and the pressure from the pressure manifold would also push fluid between the appliance slots from the side (generally depicted by the yellow arrows). This construction would be highly inefficient, and result in only a limited amount (if any) of the cooled coolant making it to the bottom of the tank. Note that the figure below is a cross-section of the tank, so the inter-server “leakage” would occur between each of the servers.



CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

258. I have annotated FIG. 7C to show, in a dotted red line, what Dr. Ortega believes is a “plenum” as claimed in claim 1. It is my opinion that a top-oriented pressure manifold, nozzles, a side volume, and a bottom volume under the servers, cannot be a plenum as claimed. Consequently, the 2014 Best Publication does not disclose a plenum, positioned adjacent to the bottom of the tank, adapted to dispense the dielectric fluid substantially uniformly upwardly through each appliance slot, and therefore the Best ‘463 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.



CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

vii. a secondary fluid circulation facility adapted to extract heat from the dielectric fluid circulating in the primary circulation facility, and to dissipate to the environment the heat so extracted; and

259. The 2014 Best Publication tank has a secondary circulation facility. The 2014 Best Publication discloses a heat exchanger and cooling apparatus for extracting heat from the dielectric fluid and transporting it to the environment. But as discussed in this section, the 2014 Best Publication fails to disclose key structural components of the tank and immersion system (such as the plenum and weir), and therefore the 2014 Best Publication is incapable of anticipating claim 1 under 35 U.S.C. § 102.

viii. a control facility adapted to coordinate the operation of the primary and secondary fluid circulation facilities as a function of the temperature of the dielectric fluid in the tank.

260. The 2014 Best Publication tank has a control facility that controls operation as a function of the temperature of the dielectric fluid. But as discussed in this section, the 2014 Best Publication fails to disclose key structural components of the tank and immersion system (such as the plenum and weir), and therefore the 2014 Best Publication is incapable of anticipating claim 1 under 35 U.S.C. § 102.

261. Although Dr. Ortega only used the four references discussed above to assert §102 anticipation in his Opening Report at Para. 240, elsewhere, for example in the claim charts, Dr. Ortega, suggests that the Oktay ‘244 Patent, The JP ‘758 Patent, and the Pfahnl Publication can also anticipate the ‘457 Patent. Although these references are very different from the ‘457 Patent, I address them below in an abundance of caution.

E. The Oktay ‘244 Patent

i. An appliance immersion cooling system:

262. To the extent the preamble may be limiting, the Oktay ‘244 Patent could be considered an immersion cooling system. However, it is of little value with regards to single phase immersion cooling as it is a two-phase system, which requires substantially different

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

structures to provide a cooling effect.

ii. a tank adapted to immerse in a dielectric fluid a plurality of electrical appliances, each in a respective appliance slot distributed vertically along, and extending transverse to, a long wall of the tank, the tank comprising:

263. The Oktay '244 Patent could be considered to immerse electrical appliances in a dielectric fluid, depending on the fluid used for the boiling liquid. The boiling liquid can be fluorocarbon liquids, for example. (4:6-11). However, the electrical appliance(s) in the Oktay '244 Patent are oriented horizontally. Also, the Oktay '244 Patent fails to disclose key structural components of the tank and immersion system, as discussed later in this section, and therefore the Oktay '244 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

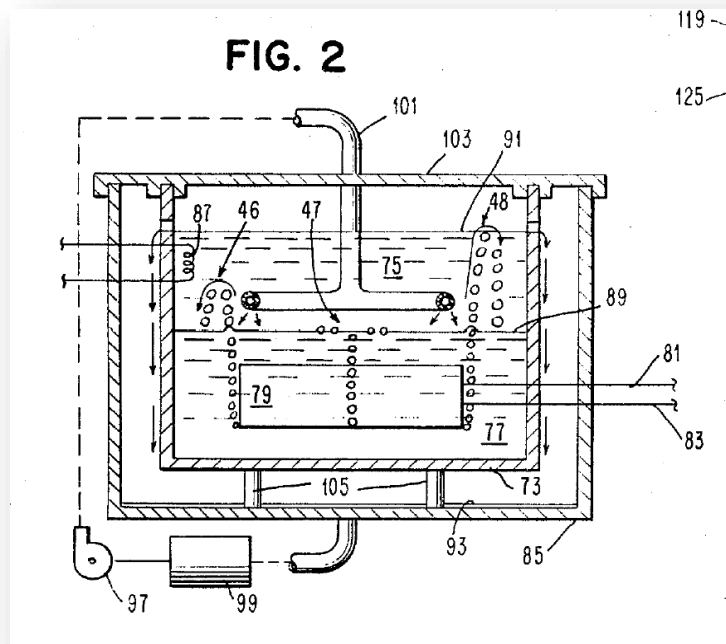
iii. a weir, integrated horizontally into the long wall of the tank adjacent to all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot.

264. “Weir” has an agreed construction of “an overflow structure or barrier that determines the level of liquid”.

265. The Oktay '244 Patent has no weir as claimed to facilitate uniform recovery of the dielectric fluid. What Dr. Ortega does not seem to understand is that the Oktay '244 Patent is a two-phase system (see Fig. 2) that uses multiple fluids to achieve cooling of immersed electronic modules. The Oktay '244 Patent has a boiling liquid (77) that is used to extract heat from the electronic module (79). The boiling liquid can be fluorocarbon liquids, for example. (4:6-11). Heat from the electronic module causes the boiling liquid to boil and form small bubbles. The vapor bubbles rise to the surface of the cooler condenser liquid (75). The condenser liquid can be water or silicate ester, for example. (4:3-6). The bubbles containing gas-phase boiling liquid (77) rise into the condensing liquid, where the vapor of the boiling liquid cools back to liquid form. The condensing of the boiling liquid is caused by heat being

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

transferred from the boiling liquid to condenser liquid. (4:25-69).



266. The Oktay '244 Patent describes an overflow orifice (91) on the rectangular container (73), which allows heated condenser liquid to "dribble" down the sidewalls of the rectangular container. As such, it is the condenser liquid (75) that overflows the container (73), and not the dielectric fluid (the boiling liquid (75)). As used in the Oktay '244 Patent, the dielectric fluid is never released from container (73).

267. As described in this section, the Oktay '244 Patent does not disclose a weir, integrated horizontally into the long wall of the tank adjacent to all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot, and therefore the Oktay '244 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

iv. a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip of the weir and adapted to receive the dielectric fluid as it flows over the weir.

268. The Oktay '244 Patent has no dielectric fluid recovery reservoir. As described above, the only liquid that overflows container (73) is the condenser liquid (75). It is the

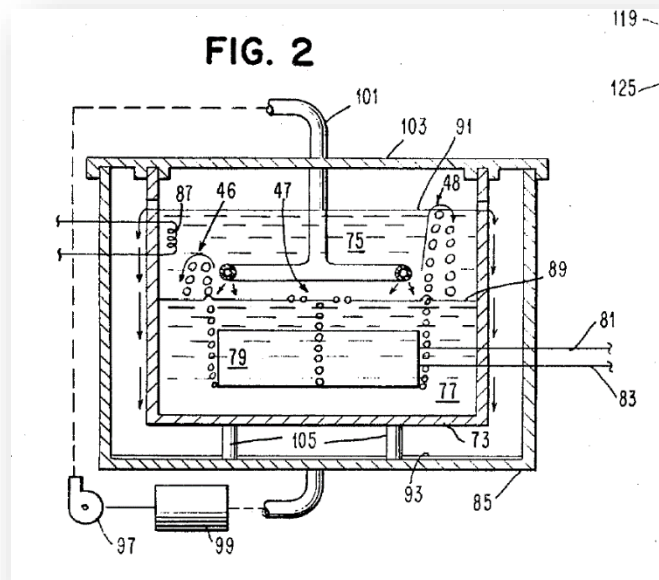
CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

condenser liquid that pools (93) at the bottom of the enclosure (85). It is not dielectric fluid. The pooled condenser liquid (75) is externally cooled (99) and is then returned to the container (73) at about the interface (89) between the boiling liquid (77) and the condenser liquid (75). As a result, the Oktay '244 Patent has no fluid recovery reservoir to receive the dielectric fluid.

269. As described in this section, the Oktay '244 Patent does not disclose a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip of the weir and adapted to receive the dielectric fluid as it flows over the weir, and therefore the Oktay '244 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

v. a primary circulation facility adapted to circulate the dielectric fluid through the tank.

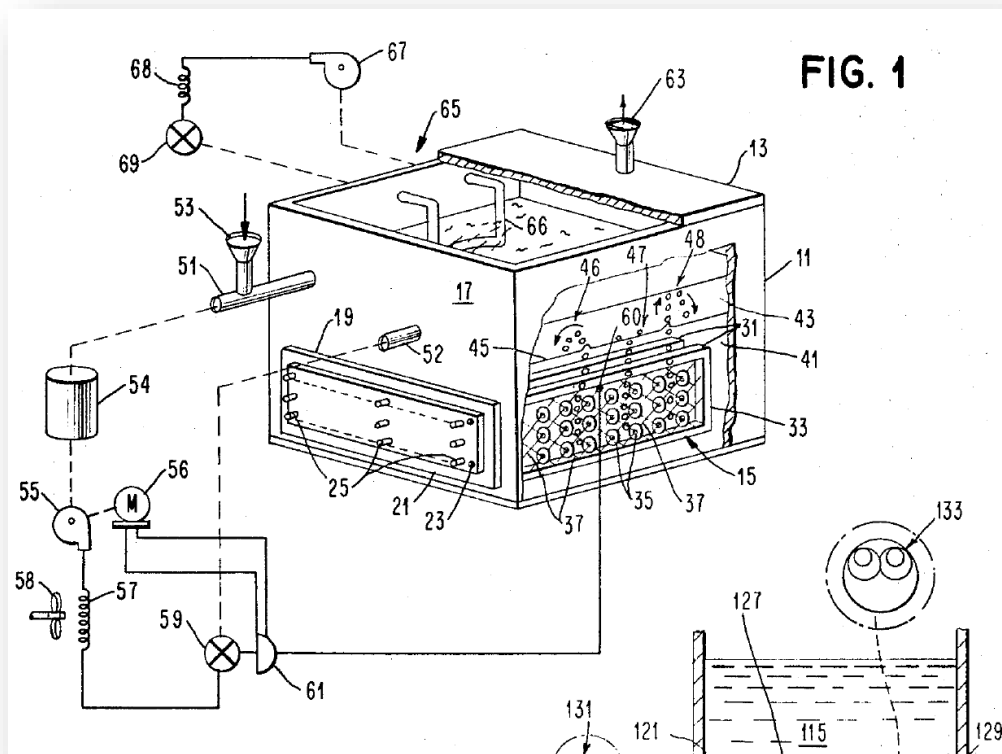
270. The Oktay '244 Patent has no primary circulation facility to circulate dielectric fluid through the tank. As described above, Fig. 2 has a pump to flow the condenser liquid, but the dielectric boiling liquid does not flow. The dielectric coolant simply has the electronic module immersed into it, and boils when the electronic module heats the local coolant to its boiling point. There is no circulation facility.



CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

271. Dr. Ortega shows the above Fig. 2 with reference to this limitation, but the cited text is to a different structure as shown in Fig. 1. But the same logic applies. In the device of Fig. 1, the hot memory array (15) causes the fluorocarbon liquid (41) to boil, and the resulting bubbles are condensed in the condensing liquid (43). A pump (55) is used to pump the condensing liquid (43) from the tank (51) through a cooling coil (57), and the condensing liquid is returned to the tank through inlet tube (52). The liquid fluorocarbon that extracts the heat from the memory array (15) is never circulated.

272. As described in this section, the Oktay '244 Patent does not disclose a primary circulation facility adapted to circulate the dielectric fluid through the tank, and therefore the Oktay '244 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.



vi. a plenum, positioned adjacent to the bottom of the tank, adapted to dispense the dielectric fluid substantially uniformly upwardly through each appliance slot.

273. “Plenum” has an agreed construction of “a structure for dispensing

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

liquid”. However, it is my understanding that claims must be read as a whole, and it is therefore inappropriate to parse a limitation of a claim into individual words. The Oktay ‘244 Patent has no plenum as claimed. As described above, the dielectric coolant in the Oktay ‘244 Patent is not circulated so it is not possible to contain a plenum, positioned adjacent to the bottom of the tank, adapted to dispense the dielectric fluid.

274. The only liquid that is circulated by overflowing container (73) is the condenser liquid (75). It is the condenser liquid that pools (93) at the bottom of the enclosure (85). It is not boiling dielectric fluid. The pooled condenser liquid (85) is externally cooled (99) and is then returned to container (73) at about the interface (89) between the boiling liquid (77) and the condenser liquid (75). This condenser fluid return is not at the bottom of container (73), but is in the middle, at the interface between the boiling liquid (77) and the condenser liquid (75).

275. As described in this section, the Oktay ‘244 Patent does not disclose a plenum, positioned adjacent to the bottom of the tank, adapted to dispense the dielectric fluid substantially uniformly upwardly through each appliance slot, and therefore the Oktay ‘244 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

vii. a secondary fluid circulation facility adapted to extract heat from the dielectric fluid circulating in the primary circulation facility, and to dissipate to the environment the heat so extracted; and

276. The Oktay ‘244 Patent has a secondary fluid circulation facility as claimed. While The Oktay ‘244 Patent does have a pump and heat exchanger (or cooler) for cooling the condenser fluid, the operation of the Oktay ‘244 Patent does not have a primary circulation facility that extracts heat from the appliances. As described above, the dielectric fluid is not circulated in the Oktay ‘244 Patent.

277. As described in this section, the Oktay ‘244 Patent does not disclose a secondary fluid circulation facility adapted to extract heat from the dielectric fluid circulating in the primary circulation facility, and to dissipate to the environment the heat so extracted, and therefore the Oktay ‘244 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

viii. a control facility adapted to coordinate the operation of the primary and secondary fluid circulation facilities as a function of the temperature of the dielectric fluid in the tank.

278. The Oktay '244 Patent would have a control facility that operates as a function of the dielectric fluid, for example, as described at (2:64 to 3:4). But as discussed in this section, the Oktay '244 Patent fails to disclose key structural components of the tank and immersion system (such as the plenum and weir utilized for the dielectric coolant), and therefore the Oktay '244 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

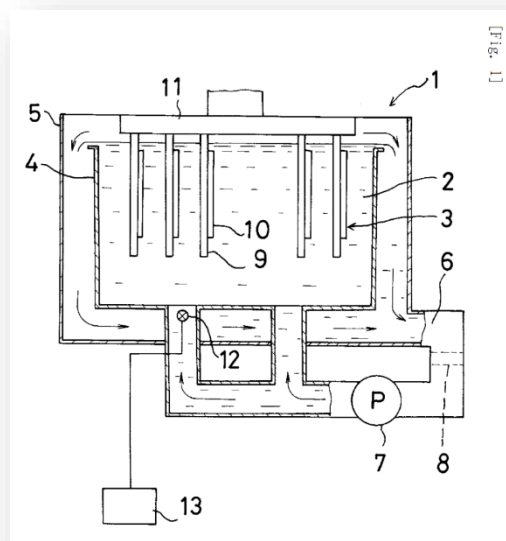
F. The JP '758 Patent

i. An appliance immersion cooling system comprising:

279. The JP '758 Patent, as best can be understood, is an immersion cooling system for semiconductor devices undergoing bias caloric tests.

ii. a tank adapted to immerse in a dielectric fluid a plurality of electrical appliances, each in a respective appliance slot distributed vertically along, and extending transverse to, a long wall of the tank, the tank comprising:

280. The JP '758 Patent discloses the semiconductor devices (10) that are mounted on boards (9) which together form a sample (3) to be tested. The test samples (3) appear to be



CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

arranged along the long wall of the inner tank (4). But, as discussed in this section, the JP ‘758 Patent fails to disclose key structural components of the tank and immersion system (such as the plenum and weir), and therefore the JP ‘758 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

iii. a weir, integrated horizontally into the long wall of the tank adjacent to all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot.

281. The JP ‘758 Patent does not have a weir or overflow lip as claimed. “Weir” has an agreed construction of “an overflow structure or barrier that determines the level of liquid.” First, it is unclear if the overflow of the inner tank extends around its full circumference, or if the overflow is restricted to just the shorter wall. Either way, the flow over the shorter wall (which is parallel to the samples), would not facilitate uniform recovery of the fluid through the appliance slots, which are also arranged parallel to the shorter wall. The immersion device (1) would have greater flow through slots that are closer to a short wall, and less flow through slots that are farther away from a short wall.

282. As described in this section, the JP ‘758 Patent does not disclose a weir, integrated horizontally into the long wall of the tank adjacent to all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot, and therefore the JP ‘758 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

iv. a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip of the weir and adapted to receive the dielectric fluid as it flows over the weir.

283. The JP ‘758 Patent does not disclose any fluid recovery reservoir. The JP ‘758 Patent seems to show the dielectric fluid overflowing the short wall of the inner tank (4) and moving the fluid on a circulating course (path) (6) to a cooling pipe (not shown). It appears that the fluid is then pumped (7) back into the bottom of the inner tank (4). Without a better description and figure, it is difficult to understand the flow and operation of this device. But, as

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

described and illustrated, it is my opinion that the JP ‘758 Patent does not disclose a fluid recovery reservoir.

284. As described in this section, the JP ‘758 Patent does not disclose a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip of the weir and adapted to receive the dielectric fluid as it flows over the weir, and therefore the JP ‘758 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

v. a primary circulation facility adapted to circulate the dielectric fluid through the tank, comprising:

285. The JP ‘758 Patent appears to have a primary circulation facility. But as discussed in this section, the JP ‘758 Patent fails to disclose key structural components of the tank and immersion system (such as the plenum and weir), and therefore JP ‘758 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

vi. a plenum, positioned adjacent to the bottom of the tank, adapted to dispense the dielectric fluid substantially uniformly upwardly through each appliance slot.

286. Dr. Ortega appears to admit in Exhibit D5 (pg. 106) that the JP ‘758 Patent does not have a plenum as claimed. I agree, the JP ‘758 Patent does not disclose a plenum.

287. As described in this section, the JP ‘758 Patent does not disclose a plenum, positioned adjacent to the bottom of the tank, adapted to dispense the dielectric fluid substantially uniformly upwardly through each appliance slot, and therefore the JP ‘758 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

vii. a secondary fluid circulation facility adapted to extract heat from the dielectric fluid circulating in the primary circulation facility, and to dissipate to the environment the heat so extracted; and

288. The JP ‘758 Patent extracts heat from the primary loop using the cooling pipe, which acts as a secondary fluid circulation facility. But as discussed in this section, the JP ‘758 Patent fails to disclose key structural components of the tank and immersion system (such as the plenum), and therefore the JP ‘758 Patent is incapable of anticipating claim 1 under 35 U.S.C. §

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

102.

viii. a control facility adapted to coordinate the operation of the primary and secondary fluid circulation facilities as a function of the temperature of the dielectric fluid in the tank.

289. It is unclear what the mechanism is that the JP ‘758 Patent uses for control, but by implication, the pump (7) may be activated and deactivated according to cooling requirements. But as discussed in this section, the JP ‘758 Patent fails to disclose key structural components of the tank and immersion system (such as the plenum and weir), and therefore the JP ‘758 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

G. The Pfahnl Publication

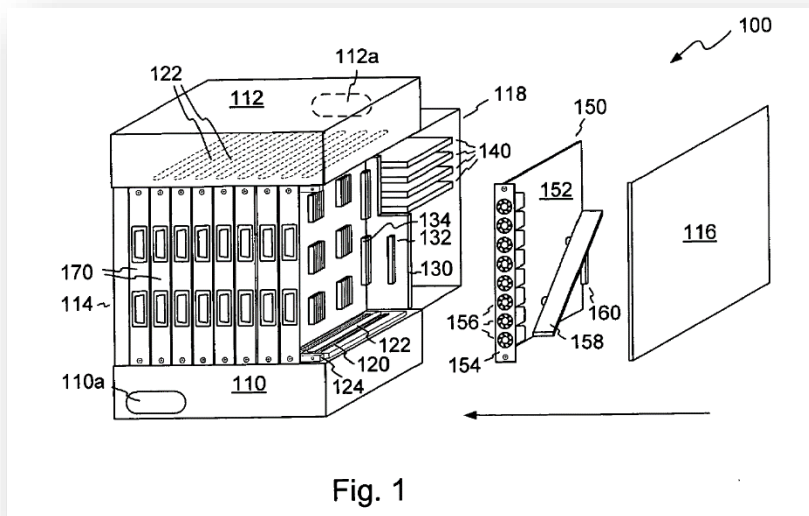
i. An appliance immersion cooling system comprising:

290. The Pfahnl Publication utilizes air for cooling orthogonally oriented arrays of parallel circuit boards. To the extent this preamble is determined to be limiting, and if a broad interpretation of dielectric fluid that includes air is adopted (which I do not), the Pfahnl Publication discloses an appliance immersion cooling system. As an example of why I do not adopt a definition of dielectric fluid that includes air, the “weir” of this claim is defined to set the level of a liquid. It is my opinion that this precludes using “air” as the dielectric fluid. As a result, I find the Pfahnl Publication is not an appliance immersion cooling system as claimed but is an air-cooled system. Further, as discussed below, the Pfahnl Publication fails to disclose several limitations of claim 1, and therefore the Pfahnl Publication is incapable of anticipating claim 1 under 35 U.S.C. § 102.

ii. a tank adapted to immerse in a dielectric fluid a plurality of electrical appliances, each in a respective appliance slot distributed vertically along, and extending transverse to, a long wall of the tank, the tank comprising:

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

291. The Pfahnl Publication does not disclose the use of a dielectric fluid, as it is an air-cooled system. The Pfahnl Publication discloses orthogonally oriented circuit boards (140) and (170). As such, the Pfahnl Publication does not disclose a plurality of electrical appliances, each in a respective appliance slot distributed vertically along, and extending transverse to, a long wall of the tank. It is my opinion that the Pfahnl Publication does not have this limitation. Therefore, the Pfahnl Publication is incapable of anticipating claim 1 under 35 U.S.C. § 102.



iii. a weir, integrated horizontally into the long wall of the tank adjacent to all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot.

292. “Weir” has an agreed construction of “an overflow structure or barrier that determines the level of liquid.” Since the Pfahnl Publication utilizes air as the dielectric coolant it is not possible for the electronic system (100) to contain a weir, integrated horizontally into the long wall of the tank. As such, the Pfahnl Publication is incapable of anticipating claim 1 under 35 U.S.C. § 102.

iv. a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip of the weir and adapted to receive the dielectric fluid as it flows over the weir.

293. As described above, the Pfahnl Publication utilizes air as the dielectric fluid and

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

as such cannot contain a weir, or an overflow lip, or a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip. It is my opinion that the Pfahnl Publication does not have this limitation. As such, the Pfahnl Publication is incapable of anticipating claim 1 under 35 U.S.C. § 102.

v. a primary circulation facility adapted to circulate the dielectric fluid through the tank, comprising:

294. The Pfahnl Publication discloses a blower assembly (150) which would function as a primary circulation facility adapted to circulate air. However, as discussed in this section, the Pfahnl Publication fails to disclose several limitations of claim 1 (such as a weir and fluid recovery reservoir positioned vertically below an overflow lip). As a result, the Pfahnl Publication is incapable of anticipating claim 1 under 35 U.S.C. § 102.

vi. a plenum, positioned adjacent to the bottom of the tank, adapted to dispense the dielectric fluid substantially uniformly upwardly through each appliance slot.

295. The Pfahnl Publication discloses a plenum (110), positioned adjacent to the bottom of the tank, adapted to dispense the air substantially uniformly upwardly through each circuit board slot. However, as discussed in this section, the Pfahnl Publication fails to disclose several limitations of claim 1 (such as a weir and fluid recovery reservoir positioned vertically below an overflow lip). Therefore, the Pfahnl Publication is incapable of anticipating claim 1 under 35 U.S.C. § 102.

vii. a secondary fluid circulation facility adapted to extract heat from the dielectric fluid circulating in the primary circulation facility, and to dissipate to the environment the heat so extracted; and

296. The Pfahnl Publication does not disclose a secondary fluid circulation facility. Although not disclosed, I would anticipate that the hot cooling air is expelled from the system to the environment. As such, the Pfahnl Publication is incapable of anticipating claim 1 under 35 U.S.C. § 102.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

viii. a control facility adapted to coordinate the operation of the primary and secondary fluid circulation facilities as a function of the temperature of the dielectric fluid in the tank.

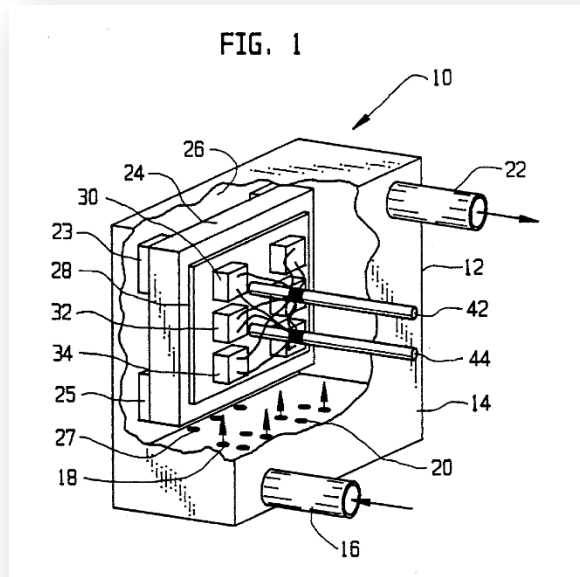
297. Since the Pfahnl Publication does not disclose a secondary fluid circulation facility, it is not possible to disclose a control facility adapted to coordinate the operation of the primary and secondary fluid circulation facilities. As such, the Pfahnl Publication is incapable of anticipating claim 1 under 35 U.S.C. § 102.

298. Dr. Ortega only used the four “Best” references to assert §102 anticipation in his Opening Report at Para. 240, and in the claim charts, Dr. Ortega, suggests that the Oktay ‘244 Patent, the JP ‘758 Patent and the Pfahnl Publication can also anticipate the ‘457 Patent. Dr. Ortega also more generally cites the Quon ‘108 Patent, the Rolfson ‘298 Patent and to the Attlesey ‘419 Patent in his report, but never suggests that each of these taken alone could render the ‘457 Patent obvious. For sake of completeness, and in an abundance of caution, I address each of these below.

H. The Quon ‘108 Patent

i. An appliance immersion cooling system comprising:

299. The Quon ‘108 Patent discloses a structure of an electronic power module which



CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

has its dies mounted to extract heat therefrom by flushing them with dielectric liquid which absorbs heat to reduce the temperature of the power module dies.

ii. a tank adapted to immerse in a dielectric fluid a plurality of electrical appliances, each in a respective appliance slot distributed vertically along, and extending transverse to, a long wall of the tank, the tank comprising:

300. The Quon ‘108 Patent does not disclose a tank adapted to immerse in a dielectric fluid a plurality of electrical appliances, each in a respective appliance slot distributed vertically along, and extending transverse to, a long wall of the tank. Although there is a housing (12) for a semiconductor power module, this should not be considered a housing as claimed, which calls for appliance slots arranged with respect to a long wall.

301. As described in this section, the Quon ‘108 Patent does not disclose a tank adapted to immerse in a dielectric fluid a plurality of electrical appliances, each in a respective appliance slot distributed vertically along, and extending transverse to, a long wall of the tank, the tank, and therefore the Quon ‘108 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

iii. a weir, integrated horizontally into the long wall of the tank adjacent to all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot.

302. “Weir” has an agreed construction of “an overflow structure or barrier that determines the level of liquid.”

303. The Quon ‘108 Patent does not disclose a weir, integrated horizontally into the long wall of the tank adjacent to all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot. Therefore, the Quon ‘108 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

iv. a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip of the weir and adapted to receive the dielectric fluid as it flows over the weir.

304. The Quon ‘108 Patent does not disclose a weir, and therefore the Quon ‘108

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

Patent does not disclose a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip of the weir and adapted to receive the dielectric fluid as it flows over the weir. Therefore, the Quon '108 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

v. a primary circulation facility adapted to circulate the dielectric fluid through the tank, comprising:

305. The Quon '108 Patent does not disclose a primary circulation facility adapted to circulate the dielectric fluid through the tank. Therefore, the Quon '108 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

vi. a plenum, positioned adjacent to the bottom of the tank, adapted to dispense the dielectric fluid substantially uniformly upwardly through each appliance slot.

306. "Plenum" has an agreed construction of "a structure for dispensing liquid." However, it is my understanding that claims must be read as a whole, and it is therefore inappropriate to parse a limitation of a claim into individual words.

307. The Quon '108 Patent does disclose a plenum positioned adjacent to the bottom of the tank. However, the plenum disclosed in the Quon '108 Patent does not dispense dielectric fluid substantially upward through each appliance slot. As described above, the Quon '108 Patent circulates dielectric fluid through a casing encompassing an electronic power module, not a plurality of appliance slots as described in the '457 Patent.

308. Considering that the Quon '108 Patent does not disclose a plenum as described in the '457 Patent with the claims read as a whole, I conclude that the Quon '108 Patent does not disclose a plenum. Therefore, the Quon '108 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

vii. a secondary fluid circulation facility adapted to extract heat from the dielectric fluid circulating in the primary circulation facility, and to dissipate to the environment the heat so extracted; and

309. The Quon '108 Patent does not disclose a secondary fluid circulation facility

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

adapted to extract heat from the dielectric fluid circulating in the primary circulation facility, and to dissipate to the environment the heat so extracted. Therefore, the Quon '108 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

viii. a control facility adapted to coordinate the operation of the primary and secondary fluid circulation facilities as a function of the temperature of the dielectric fluid in the tank.

310. The Quon '108 Patent does not disclose a control facility adapted to coordinate the operation of the primary and secondary fluid circulation facilities as a function of the temperature of the dielectric fluid in the tank. Therefore, the Quon '108 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

I. The Rolfson '298 Patent

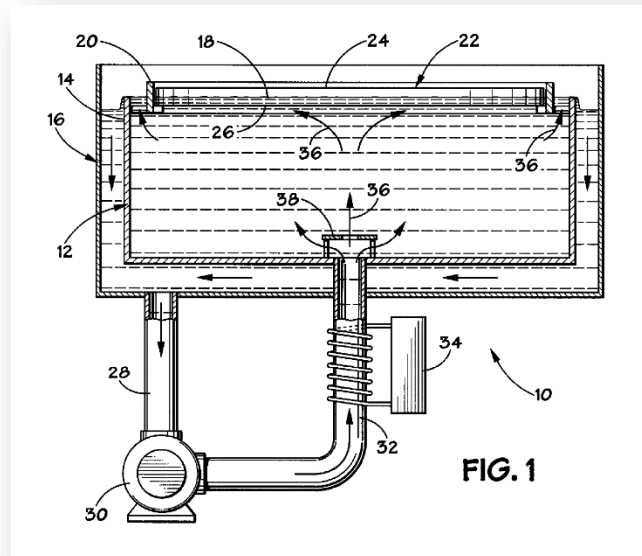
i. An appliance immersion cooling system comprising:

311. The Rolfson '298 Patent relates to the process of photolithography, and more specifically to baking a photoresist onto a substrate, such as a photomask, during the photolithography process. It is my opinion that the Rolfson '298 Patent cannot anticipate the '457 Patent under 35 USC §102.

ii. a tank adapted to immerse in a dielectric fluid a plurality of electrical appliances, each in a respective appliance slot distributed vertically along, and extending transverse to, a long wall of the tank, the tank comprising:

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

312. The Rolfson '298 Patent discloses propylene glycol or similar fluid as the coolant which is not a dielectric fluid.



313. The Rolfson '298 Patent discloses a retaining device (20), that holds the semiconductor for fabrication which is only partially disposed within the primary tank (12) as opposed to the immersed appliances of the '457 Patent that are distributed vertically along, and extending transverse to, a long wall of the tank. Therefore, the Rolfson '298 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

iii. a weir, integrated horizontally into the long wall of the tank adjacent to all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot.

314. “Weir” has an agreed construction of “an overflow structure or barrier that determines the level of liquid”.

315. The Rolfson '298 Patent does disclose an overflow structure that determines the level of liquid, however, as described above, it is not disclosed as integrated into the long wall of the tank adjacent to all appliance slots or having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flow through each appliance slot. Considering that the Rolfson '298 Patent does not disclose a weir as described in the '457

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

Patent with the claim read as a whole, I conclude that the Rolfson '298 Patent does not disclose a weir. Therefore, the Rolfson '298 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

vi. a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip of the weir and adapted to receive the dielectric fluid as it flows over the weir.

316. The Rolfson '298 Patent does not disclose a fluid recovery reservoir. Instead, it discloses a continuous flow system where coolant exits the primary tank (12) and enters the return line (28). As described above, the Rolfson '298 Patent does not employ a dielectric coolant in the disclosed system. the Rolfson '298 Patent therefore does not disclose a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip of the weir and adapted to receive the dielectric fluid as it flows over the weir. Therefore, the Rolfson '298 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

v. a primary circulation facility adapted to circulate the dielectric fluid through the tank, comprising:

317. The Rolfson '298 Patent does disclose a primary circulation facility that includes a temperature control unit (34). However, as discussed above, the Rolfson '298 Patent does not disclose the use of a dielectric fluid. Therefore, the Rolfson '298 Patent does not disclose a primary circulation facility adapted to circulate the dielectric fluid through the tank. Therefore, the Rolfson '298 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

vi. a plenum, positioned adjacent to the bottom of the tank, adapted to dispense the dielectric fluid substantially uniformly upwardly through each appliance slot.

318. The Rolfson '298 Patent discloses utilizing a baffle (38) or a series of baffles to control the flow of the liquid bath (18) and properly disperse the coolant and not a plenum. Further, as stated above, the Rolfson '298 Patent does not disclose the use of a dielectric fluid. Therefore, the Rolfson '298 Patent does not disclose a plenum. Therefore, the Rolfson '298 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

vii. a secondary fluid circulation facility adapted to extract heat from the dielectric fluid circulating in the primary circulation facility, and to dissipate to the environment the heat so extracted; and

319. The Rolfson ‘298 Patent utilizes a temperature control unit (34) to maintain the desired temperature of the cooling fluid. While this could be considered a secondary fluid circulation facility, it is my understanding that claims must be read as a whole, and it is therefore inappropriate to parse a limitation of a claim into individual words. Therefore, the Rolfson ‘298 Patent does not disclose a secondary fluid circulation facility adapted to extract heat from the dielectric fluid circulating in the primary circulation facility, and to dissipate to the environment the heat so extracted. Therefore, the Rolfson ‘298 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

viii. a control facility adapted to coordinate the operation of the primary and secondary fluid circulation facilities as a function of the temperature of the dielectric fluid in the tank.

320. The Rolfson ‘298 Patent utilizes a pump to circulate the cooling fluid. While this would require a control facility, it is my understanding that claims must be read as a whole, and it is therefore inappropriate to parse a limitation of a claim into individual words. Also, as described above, the Rolfson ‘298 Patent does not utilize a dielectric coolant. Therefore, the Rolfson ‘298 Patent does not disclose a control facility adapted to coordinate the operation of the primary and secondary fluid circulation facilities as a function of the temperature of the dielectric fluid in the tank. Therefore, the Rolfson ‘298 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

J. The Attlesey ‘419 Patent

i. An appliance immersion cooling system comprising:

321. The Attlesey ‘419 Patent discloses a liquid submersion cooling system, and in particular to a liquid submersion cooling system that is suitable for cooling electronic devices, including computer systems. The disclosure, including supporting figures, focuses on desktop

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

computers. As discussed below, it is my opinion that the Attlesey ‘419 Patent cannot anticipate the ‘457 Patent under 35 USC §102.

ii. a tank adapted to immerse in a dielectric fluid a plurality of electrical appliances, each in a respective appliance slot distributed vertically along, and extending transverse to, a long wall of the tank, the tank comprising:

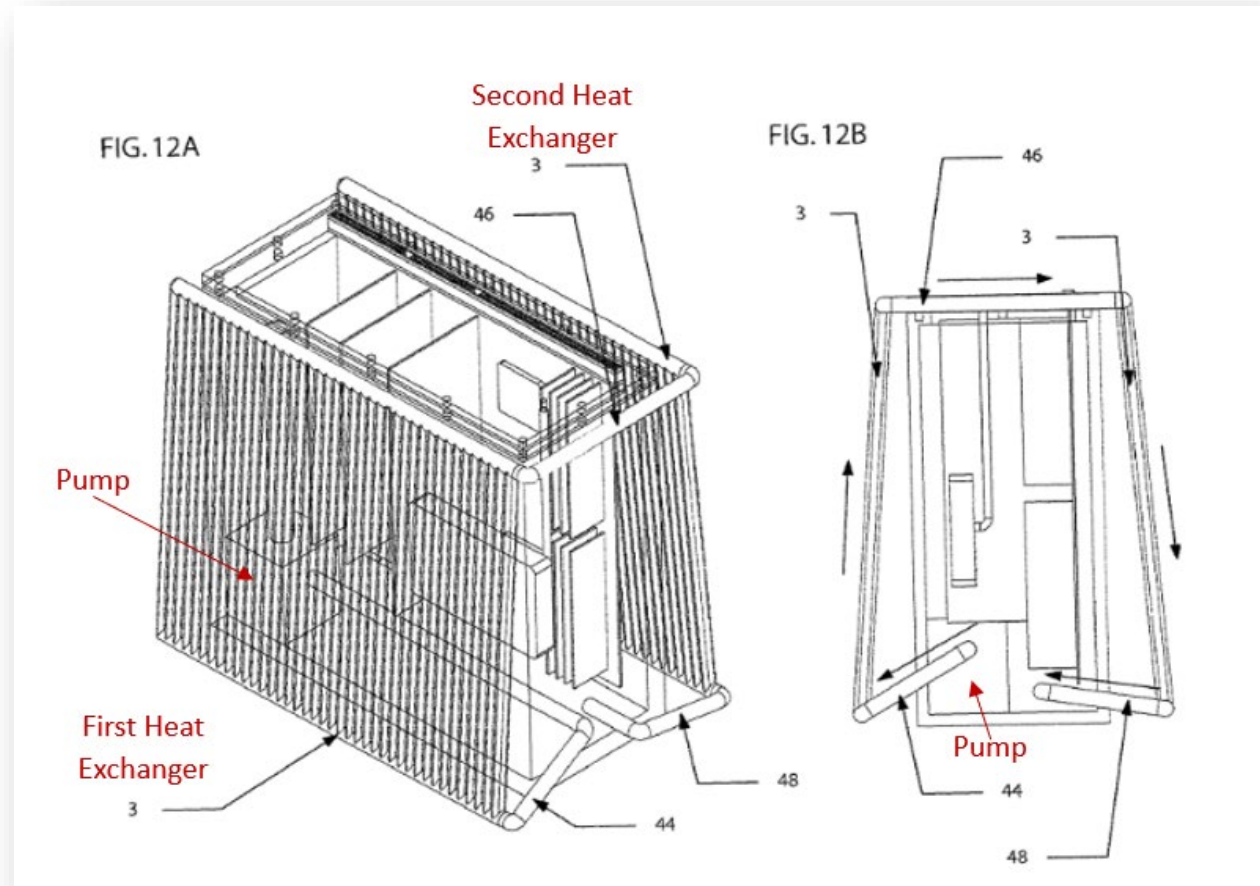
322. The Attlesey ‘419 Patent does disclose a tank adapted to immerse in a dielectric fluid a plurality of electrical appliances, each in a respective appliance slot distributed vertically along, and extending transverse to, a long wall of the tank. However, as discussed below, the Attlesey ‘419 Patent fails to disclose many of the other limitations, so it cannot anticipate claim 1 of the ‘457 Patent under 35 U.S.C. § 102.

iii. a weir, integrated horizontally into the long wall of the tank adjacent to all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid flowing through each appliance slot.

323. “Weir” has an agreed construction of “an overflow structure or barrier that determines the level of liquid.”

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

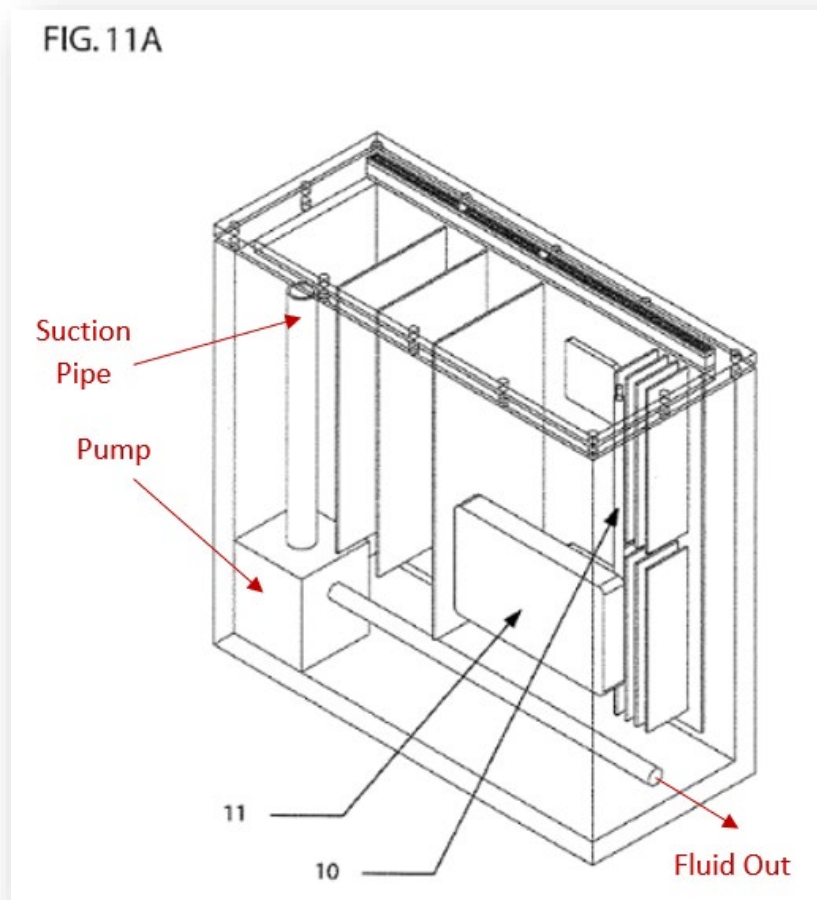
324. The Attlesey '419 Patent does not disclose a weir, integrated horizontally into the long wall of the tank adjacent all appliance slots, having an overflow lip adapted to facilitate substantially uniform recovery of the dielectric fluid.



325. As can be seen from Figs 12A and 12B, duplicated above, the Attlesey '419 Patent discloses a computer case that has **HEAT EXCHANGERS** (3) mounted to opposite exterior walls. Electrical devices are positioned inside the computer case, which is liquid tight, and the computer case is filled with a dielectric liquid. A **PUMP** is in the tank and pumps fluid out of the computer case using pipe (44), which directs the fluid to one of the **HEAT EXCHANGERS** (3). The fluid flows through the first **HEAT EXCHANGER** (3) and then the coolant flows through pipe (46) to the second **HEAT EXCHANGER** (3). The fluid flows through the second heat exchanger and pipe (48) directs the cooled fluid back to the computer case.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

326. Additional details can be seen in Fig. 11A, below. Here the position of the **PUMP** in the tank is more clearly visible, with the out-flow pipe extending out the bottom of the sidewall of the computer case to the first heat exchanger 3 (not shown). The **PUMP** draws the fluid from the top area of the computer case using a **SUCTION PIPE**.



327. As can be seen, the Attlesley '419 Patent does not have a weir but uses a vertically oriented **SUCTION PIPE** to suction fluid from the top portion of the tank. It is my opinion that the Attlesley '419 Patent does not meet this limitation and therefore, the Attlesley '419 Patent cannot anticipate the '457 Patent under 35 USC §102.

vi. a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip of the weir and adapted to receive the dielectric fluid as it flows over the weir.

328. The Attlesley '419 Patent does not disclose a weir, or an overflow lip as discussed

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

above. Therefore, the Attlesey '419 Patent does not disclose a dielectric fluid recovery reservoir positioned vertically beneath the overflow lip of the weir. It is my opinion that the Attlesey '419 Patent does not meet this limitation and therefore, the Attlesey '419 Patent cannot anticipate the '457 Patent under 35 USC §102.

v. a primary circulation facility adapted to circulate the dielectric fluid through the tank, comprising:

329. The Attlesey '419 Patent discloses one interconnected circulation facility that pumps the dielectric coolant from the computer case, through two **HEAT EXCHANGERS**, and then back into the computer case. These structures could be interpreted as a primary circulation facility adapted to circulate the dielectric fluid through the tank. However, the Attlesey '419 Patent fails to disclose key structural components of Claim 1 of the '457 Patent (such as the plenum and weir), and therefore the Attlesey '419 Patent is incapable of anticipating claim 1 under 35 USC §102.

vi. a plenum, positioned adjacent to the bottom of the tank, adapted to dispense the dielectric fluid substantially uniformly upwardly through each appliance slot.

330. The Attlesey '419 Patent utilizes a coolant return line (48) that delivers the coolant to the lower portion of the tank. While the Attlesey '419 Patent does disclose the use of “nozzles over critical components that require cooling” and “nozzles may be incorporated to direct the flow of the return liquid at specific, high-temperature areas like CPU’s” (Col 5, ln 7 - 10) it does not disclose that the return line is adapted to dispense the dielectric fluid substantially uniformly upwardly through each appliance slot. the Attlesey '419 Patent therefore does not disclose a plenum as claimed.

331. The Attlesey '419 Patent does not disclose a plenum, positioned adjacent to the bottom of the tank, adapted to dispense the dielectric fluid substantially uniformly upwardly through each appliance slot and therefore, the Attlesey '419 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

vii. a secondary fluid circulation facility adapted to extract heat from the dielectric fluid circulating in the primary circulation facility, and to dissipate to the environment the heat so extracted; and

332. The Attlesey '419 Patent discloses one interconnected circulation facility that circulates the dielectric coolant, extracts heat from the dielectric fluid, and dissipates the extracted heat to the environment using two **HEAT EXCHANGERS**. This structure could be interpreted as a secondary fluid circulation facility adapted to extract heat from the dielectric fluid circulating in the primary circulation facility, and to dissipate to the environment the heat so extracted. However, the Attlesey '419 Patent fails to disclose key structural components of Claim 1 of the '457 patent (such as the plenum and weir), and therefore the Attlesey '419 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

viii. a control facility adapted to coordinate the operation of the primary and secondary fluid circulation facilities as a function of the temperature of the dielectric fluid in the tank.

333. The Attlesey '419 Patent discloses one interconnected circulation facility that circulates the dielectric coolant, extracts heat from the dielectric fluid, and dissipates the extracted heat to the environment. This circulation facility would require a control facility. However, the Attlesey '419 Patent fails to disclose key structural components of Claim 1 of the '457 Patent (such as the plenum and weir), and therefore the Attlesey '419 Patent is incapable of anticipating claim 1 under 35 U.S.C. § 102.

XIII. ANALYSIS OF CLAIM 1 UNDER 35 USC § 103 (OBVIOUSNESS)

A. Single Reference Obviousness

334. Generally, I have been instructed that obviousness under 35 U.S.C. § 103 typically requires a combination of two or more prior art references, where the combination of art has all the limitations of the claim, and there is also a motivation to combine. However, I have also been informed that Dr. Ortega's report also may allege that each piece of prior art, taken alone but combined with the skill of a POSITA, may find claim 1 obvious. In an

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

abundance of caution, I therefore address this “single claim obviousness” allegation. It is my opinion that the application of a single claim obviousness to each of the art cited by Dr. Ortega cannot render claim 1 obvious. Each individual piece of prior art is addressed below.

B. GRC GEN 1 Tank

335. As set out in the Anticipation section of this Report regarding claim 1, the GRC GEN 1 Tank fails to disclose at least (1) a weir, let alone a weir as claimed, (2) an overflow lip on a weir, (3) a dielectric fluid recovery tank and (4) a plenum as claimed. These structures are fundamental to the invention, and I find no evidence that a POSITA would find it obvious to modify the GRC GEN 1 Tank to incorporate these structures. If Dr. Ortega has reached such a conclusion, he is inappropriately applying hindsight in his analysis. Further, Mr. Best testified that it would be disadvantageous to place a plenum adjacent to the bottom of the tank²⁴, which not only teaches away from the invention of claim 1 but shows that a POSITA would not have made such a leap. It is my opinion that the GRC GEN 1 Tank, in combination with the skills of a POSITA, would not render claim 1 invalid.

C. The Best ‘463 Patent

336. As set out in the Anticipation section of this Report regarding claim 1, the Best ‘463 Patent fails to disclose at least (1) a weir, let alone a weir as claimed, (2) an overflow lip on a weir, (3) a dielectric fluid recovery tank, and (4) a plenum as claimed. These structures are fundamental to the invention, and I find no evidence that a POSITA would find it obvious to modify the Best ‘463 Patent to incorporate these structures. If Dr. Ortega has reached such a conclusion, he is inappropriately applying hindsight in his analysis. Further, Mr. Best testified that it would be disadvantageous to place a plenum adjacent to the bottom of the tank, which not only teaches away from the invention of claim 1 but shows that a POSITA would not have made such a leap. It is my opinion that the Best ‘463 Patent, in combination with the skills of a POSITA, would not render claim 1 invalid.

²⁴ Deposition of Christiaan Best at 122:23-124:1

*CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER****D. The Best ‘914 Patent***

337. The Best ‘914 Patent is a continuation of the Best ‘463 Patent, and therefore has the same disclosure as in the application that issued as the Best ‘463 Patent. The Best ‘463 Patent was cited and used by the Examiner during prosecution of the ‘463 patent. If anything, new was added by the Best ‘914 Patent over what was disclosed in the Best ‘463 Patent, then the new material would be considered new matter and not be considered prior art to the ‘457 Patent. As a result, the same analysis as was done for the Best ‘463 Patent applies to the ‘Best ‘914 Patent, as acknowledged by Dr. Ortega in Para. 240 of his Opening Report. To reduce duplication, the analysis done for the Best ‘463 Patent is incorporated herein in its entirety as if fully set forth. It is my opinion that the Best ‘463 Patent, in combination with the skills of a POSITA, would not render claim 1 invalid.

E. The 2014 Best Publication

338. As set out in the Anticipation section of this Report regarding claim 1, the tank of the 2014 Best Publication fails to disclose at least (1) a weir, let alone a weir as claimed, (2) an overflow lip on a weir, (3) a dielectric fluid recovery tank and (4) a plenum as claimed. These structures are fundamental to the invention, and I find no evidence that a POSITA would find it obvious to modify the tank of the 2014 Best Publication to incorporate these structures. If Dr. Ortega has reached such a conclusion, he is inappropriately applying hindsight in his analysis. Further, Mr. Best testified that it would be disadvantageous to place a plenum adjacent to the bottom of the tank, which not only teaches away from the invention of claim 1 but shows that a POSITA would not have made such a leap. It is my opinion that the Best Publication, in combination with the skills of a POSITA, would not render claim 1 invalid. As noted before, the 2014 Best Publication is not a prior art reference if Midas maintains its March 14, 2012, date of invention.

F. The Oktay ‘244 Patent

339. As set out in the Anticipation section of this Report regarding claim 1, the Oktay ‘244 Patent fails to disclose at least (1) a weir, let alone a weir as claimed, (2) an overflow lip on

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

a weir, (3) a fluid recovery tank and (4) a plenum as claimed. Further the Oktay '244 Patent fails to disclose a (1) primary circulation facility. These structures are fundamental to the invention, and I find no evidence that a POSITA would find it obvious to modify the Oktay '244 Patent to incorporate these structures. If Dr. Ortega has reached such a conclusion, he is inappropriately applying hindsight in his analysis. Further, Mr. Best testified that it would be disadvantageous to place a plenum adjacent the bottom of the tank, which not only teaches away from the invention of claim 1 but shows that a POSITA would not have made such a leap. It is my opinion that the Oktay '244 Patent, in combination with the skills of a POSITA, would not render claim 1 invalid.

G. The JP '758 Patent

340. As set out in the Anticipation section of this Report regarding claim 1, the JP '758 Patent fails to disclose at least (1) a weir, let alone a weir as claimed, (2) an overflow lip on a weir, (3) a fluid recovery tank and (4) a plenum as claimed. These structures are fundamental to the invention, and I find no evidence that a POSITA would find it obvious to modify the JP '758 Patent to incorporate these structures. If Dr. Ortega has reached such a conclusion, he is inappropriately applying hindsight in his analysis. Further, Mr. Best testified that it would be disadvantageous to place a plenum adjacent to the bottom of the tank, which not only teaches away from the invention of claim 1 but shows that a POSITA would not have made such a leap. It is my opinion that the JP '758 Patent in combination with the skills of a POSITA would not render claim 1 invalid.

H. The Pfahnl Publication

341. As set out in the Anticipation section of this Report regarding claim 1, the Pfahnl Publication is an air-cooled device, and is not an immersion cooling system as claimed, and does not disclose the use of a liquid dielectric fluid. The Pfahnl Publication also fails to disclose at least (1) a weir, (2) an overflow lip on a weir, (3) a dielectric fluid recovery tank and (4) a plenum as claimed. These structures are fundamental to the invention, and I find no evidence that a POSITA would find it obvious to modify the Pfahnl Publication to incorporate these

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

structures. If Dr. Ortega has reached such a conclusion, he is inappropriately applying hindsight in his analysis. Further, Mr. Best testified that it would be disadvantageous to place a plenum adjacent to the bottom of the tank, which not only teaches away from the invention of claim 1 but shows that a POSITA would not have made such a leap. It is my opinion that the Pfahnl Publication, in combination with the skills of a POSITA, would not render claim 1 invalid.

I. The Quon ‘108 Patent

342. As set out in the Anticipation section of this Report regarding claim 1, the Quon ‘108 Patent is for semiconductor device cooling and is not an immersion cooling system as claimed. Quon ‘108 also fails to disclose at least (1) a weir, let alone a weir as claimed, (2) an overflow lip on a weir, (3) a fluid recovery tank and (4) a plenum as claimed. These structures are fundamental to the invention, and I find no evidence that a POSITA would find it obvious to modify the Quon ‘108 Patent to incorporate these structures. If Dr. Ortega has reached such a conclusion, he is inappropriately applying hindsight in his analysis. Further, Mr. Best testified that it would be disadvantageous to place a plenum adjacent to the bottom of the tank, which not only teaches away from the invention of claim 1 but shows that a POSITA would not have made such a leap. It is my opinion that the Quon ‘108 Patent, in combination with the skills of a POSITA, would not render claim 1 invalid.

J. The Rolfson ‘298 Patent

343. As set out in the Anticipation section of this Report regarding claim 1, the Rolfson ‘298 Patent is for semiconductor device cooling and is not an immersion cooling system as claimed. Indeed, the Rolfson ‘298 Patent does not even use a dielectric fluid but uses a standard cooling liquid. The Rolfson ‘298 Patent also fails to disclose at least (1) a weir, let alone a weir as claimed, (2) an overflow lip on a weir, (3) a dielectric fluid recovery tank and (4) a plenum as claimed. These structures are fundamental to the invention, and I find no evidence that a POSITA would find it obvious to modify the Rolfson ‘298 Patent to incorporate these structures. If Dr. Ortega has reached such a conclusion, he is inappropriately applying hindsight in his analysis. Further, Mr. Best testified that it would be disadvantageous to place a plenum

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

adjacent to the bottom of the tank, which not only teaches away from the invention of claim 1 but shows that a POSITA would not have made such a leap. It is my opinion that the Rolfson '298 Patent, in combination with the skills of a POSITA, would not render claim 1 invalid.

K. The Attlesey '419 Patent

344. As set out in the Anticipation section of this Report regarding claim 1, the Attlesey '419 Patent fails to disclose at least (1) a weir, let alone a weir as claimed, (2) an overflow lip on a weir, (3) a fluid recovery tank and (4) a plenum as claimed. These structures are fundamental to the invention, and I find no evidence that a POSITA would find it obvious to modify the Rolfson '298 Patent to incorporate these structures. If Dr. Ortega has reached such a conclusion, he is inappropriately applying hindsight in his analysis. Further, Mr. Best testified that it would be disadvantageous to place a plenum adjacent to the bottom of the tank, which not only teaches away from the invention of claim 1 but shows that a POSITA would not have made such a leap. It is my opinion that the Attlesey '419 Patent in combination with the skills of a POSITA, would not render claim 1 invalid.

L. Combination of References

345. In his report, Dr. Ortega makes broad statements regarding the obviousness of combining two or more references selected from his list of cited art. The list of cited art by Dr. Ortega includes references that the parties have agreed will no longer be part of the invalidity analysis. Accordingly, the following are the references cited by Dr. Ortega:

- GRC GEN 1 Tank
- The 2014 Best Publication (not available if March 14, 2012, is the date of invention)
- The '463 Patent
- The '914 Patent
- The Oktay '244 Patent
- The JP '758 Patent
- The Pfahnl '292 Publication
- The Quon '108 Patent

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

- The Rolfson ‘298 Patent
- The Attlesey ‘419 Patent

M. Not All Limitations Found

346. Every one of the ten references cited by Dr. Ortega is missing several limitations required by claim 1. In particular, every reference Dr. Ortega cites to is missing (1) a weir, let alone a weir as claimed, (2) an overflow lip on a weir, (3) a fluid recovery tank and (4) a plenum as claimed. Further, as I discuss in the “Single Reference Obviousness” section, it would not have been obvious for a POSITA to modify any individual reference to include these structures. As a consequence, Dr. Ortega is incapable of finding any combination of the cited references that teaches, suggests, or discloses all the limitations of claim 1.

347. If the date of invention is March 14, 2012 and the 2014 Best Publication is not a reference, then it is my opinion that there is no combination of the nine remaining references cited by Dr. Ortega that disclose, teach, or suggest all the limitations of claim 1 of the ‘457 Patent, and in particular, every combination will be missing at least the limitations to the (1) weir, (2) overflow lip on a weir, (3) fluid recovery tank and (4) plenum as claimed. As a result, no combination of the nine references can render claim 1 obvious under 35 U.S.C. 103.

348. If the 2014 Best Publication is a reference, then it is my opinion that there is no combination of the ten references cited by Dr. Ortega that disclose, teach, or suggest all the limitations of claim 1 of the ‘457 Patent, and in particular, every combination will be missing at least the limitations to the (1) weir, (2) overflow lip on a weir, (3) fluid recovery tank and (4) plenum as claimed. As a result, no combination of the ten references can render claim 1 obvious under 35 USC 103.

N. Non-Analogous Art

349. It is my opinion that the following of the art cited by Dr. Ortega are not analogous art and therefore not appropriate to cite as a reference. Each is discussed below.

- The Oktay ‘244 Patent
- The Pfahnl ‘292 Publication

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

- The Quon ‘108 Patent
- The Rolfson ‘298 Patent

350. The Oktay ‘244 Patent is a two-phase cooling system, and not a single-phase system as disclosed and claimed in the ‘457 Patent. It is my understanding that a two-phase system operates on a very different cooling process and requires substantially different structures as compared to a single-phase system. A two-phase system relies on the hot electronics “boiling” one liquid, which is subsequently cooled and condensed by introducing it into a second liquid. I further understand that there are substantial risks involved in implementation of a two-phase cooling system, such as the health and safety of people working on or near the cooling system. As a result, a POSITA implementing a single-phase cooling system would not be interested in structures used in two-phase systems and would further not be interested in taking on the additional burdens of implementing a two-phase system. The Abstract for The Oktay ‘244 Patent is duplicated below.

ABSTRACT OF THE DISCLOSURE

A cooling system is provided for cooling heat generating electronic components which are completely immersed in a liquid having a low temperature boiling point. This dielectric liquid, such as a fluorocarbon, preferably boils only somewhat above ambient room temperature at atmospheric pressure. A second liquid having a lower density and a higher boiling point than the first mentioned liquid is superimposed on the first liquid resulting in an interface between the two liquids where nucleate boiling bubbles generated in the first fluid are principally condensed. The superimposed liquid is maintained at a predetermined temperature by means of a cooling arrangement.

351. The Oktay ‘244 Patent does not cool electronic parts using a single-phase dielectric cooling liquid but uses a more complex and risky two-phase system. One of the goals for the ‘457 Patent was to use a single-phase liquid immersion cooling system as an improvement over an air-cooled system. If a POSITA is looking for an advancement in single phase cooling using a dielectric fluid, they would not consider a patent directed to a two-phase cooling system to be analogous, such as The Oktay ‘244 Patent. In my opinion, a POSITA in

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

immersion cooling for electronic equipment would not find a patent regarding two-phase cooling to be an analogous reference. Accordingly, The Oktay '244 Patent should be eliminated as a cited reference.

352. Pfahnl '292 is an air-cooled system. Although in a broad sense air could be considered a dielectric fluid, claim 1 and specification for the '457 Patent are abundantly clear that the '457 Patent is directed solely to a liquid dielectric. Although someone may be interested in the Pfahnl Publication if they are looking for a better way to air cool electronics, the Pfahnl Publication has no applicability to cooling electronics using a liquid dielectric fluid. The Pfahnl Abstract is duplicated below.

An electronic system is disclosed that uses air for cooling first and second orthogonally oriented arrays of parallel circuit boards. Air is drawn into the front of the system, passes alongside the circuit boards in the first array, takes a 90-degree turn, continues over the circuit boards in the second array, and takes another 90-degree turn to exhaust through the rear of the system. The circuit boards in the first array are cooled through a separate airflow path, which preferably also runs front-to-rear.

353. Pfahnl '292 does not cool electronic parts using a dielectric liquid but uses air. One of the goals for the '457 Patent was to use a liquid immersion cooling system as an improvement over an air-cooled system. If a POSITA is looking for an advancement in cooling using liquid over what air can provide, they would not consider a patent directed to air cooling to be analogous, such as Pfahnl '292. In my opinion, a POSITA in immersion cooling for electronic equipment would not find a patent regarding air cooling to be an analogous reference. Accordingly, Pfahnl '292 should be eliminated as a cited reference.

354. The Quon '108 Patent is directed to a structure for cooling the inner components of a semiconductor power module. The Quon '108 Patent is intended to be an advancement from the known way of cooling the housing for power modules, to now cooling the power

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

modules from within. (Quon 1:21-37). First, the Quon ‘108 Patent starts from the premise that merely cooling the outside housing of a power module or semiconductor housing is not sufficient. But this is exactly what the immersion cooling system for the ‘457 Patent does: it cools the housings for electronic components by exposing the components to a dielectric fluid. Although someone may be interested in the Quon ‘108 Patent if they are looking for a better way to cool the inside of a semiconductor housing, the Quon ‘108 Patent has no applicability to cooling the semiconductor housing itself. The relevant portion of the Background of the Invention section of The Quon ‘108 Patent is duplicated below.

It is conventional to remove heat from the dies of an electronic power module by hermetically enclosing the dies in a housing and then cooling the housing. Power modules containing this type of semiconductor component are traditionally attached to a cold plate. The cold plate may have fins thereon with circulation of fluid therepast. The fluid is usually liquid when greater amounts of heat must be dissipated. The heat has to travel from the die through the many layers of material before arriving at the cold plate or the housing case. The resistance to heat flow through each of the materials and interfaces causes the die to operate at a higher temperature or at a lower current level. It can be seen that, by reducing the material layers and interfaces between the coolant fluid and the heat-producing die, heat can be more readily extracted so that a die can carry higher current at the same junction temperature.

355. In my opinion, a POSITA in immersion cooling for electronic equipment would not find a patent regarding cooling the inside of a semiconductor module to be an analogous reference. Accordingly, The Quon ‘108 Patent should be eliminated as a cited reference.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

356. Rolfson ‘298 is directed to a method and apparatus of uniformly baking substrates such as photomask for photolithography. Contrary to what Dr. Ortega asserts in his report at ¶360, Rolfson ‘298 is not directed to cooling electronic computing parts but is to be baking a film onto a substrate. The general process and application are set out in the Abstract, repeated below.

A method and apparatus for baking a film onto a substrate. A film, such as a layer of photoresist, is disposed on a first surface of a substrate while a second surface is exposed to a liquid bath. The liquid bath is maintained at a pre-selected temperature. Exposure of the substrate to the liquid bath allows the film on the opposite surface to bake. The liquid bath is then re-circulated to maintain a constant and uniform temperature gradient across the substrate.

357. The Rolfson ‘298 Patent does not cool electronic parts, and so does not even use dielectric fluid. Instead, the Rolfson ‘298 Patent uses standard and accepted cooling liquids. In my opinion, a POSITA in immersion cooling for electronic equipment would not find a patent regarding a process to back a film on a substrate to be an analogous reference. Accordingly, the Rolfson ‘298 Patent should be eliminated as a cited reference.

O. Motivation to Combine

358. For similar reasons I articulate in the “Non-Analogous Art” section above, it is my opinion that a POSITA would have no motivation to combine the same references with any other of the references that Dr. Ortega cites. The four references are listed here and discussed below.

- The Oktay ‘244 Patent
- The Pfahnl ‘292 Publication
- The Quon ‘108 Patent
- The Rolfson ‘298 Patent

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

359. As to the Oktay, ‘244 Patent, to reduce redundancy I incorporate by reference my analysis in the “Non-Analogous Art” section as if set forth here in its entirety.

360. There is no teaching or suggestion in the Oktay ‘244 Patent that it could be used in a single-phase system. This is in line with the common sense of a POSITA, who would not consider structures and processes in a two-phase system to be useful in designing a single-phase immersion cooling system. Although the need for improved cooling of electronics would have been generally known by a POSITA, the Oktay ‘244 Patent is from 1966, and so a POSITA would not be motivated to consider a 1966 two-phase patent when addressing electronic cooling needs in 2010. Finally, a POSITA design incentive would include safety considerations, which would disincentivize a POSITA from considering the Oktay ‘244 Patent a two-phase system.

361. It is my opinion that there is no motivation for a POSITA to use the Oktay ‘244 Patent in combination with any other reference cited by Dr. Ortega.

362. As to the Pfahnl Publication, to reduce redundancy I incorporate by reference my analysis in the “Non-Analogous Art” section as if set forth here in its entirety.

363. There is no teaching or suggestion in the Pfahnl Publication that its air-cooling system could be used in a liquid single-phase cooling system. This is in line with the common sense of a POSITA, who would not consider structures and processes for an air-cooled system to be useful in designing a liquid single-phase immersion cooling system. Although the need for improved cooling of electronics would have been generally known by a POSITA, the Pfahnl Publication is an air-cooled system, and so a POSITA would not be motivated to consider an air-cooled system. Air-cooled electronics have been around for decades, and a POSITA would be motivated to find alternatives to air cooling. Finally, a POSITA design incentive would include reduced cooling footprint as compared to air cooling, which would disincentivize a POSITA from considering the Pfahnl Publication air-cooled system.

364. It is my opinion that there is no motivation for a POSITA to use the Pfahnl Publication in combination with any other reference cited by Dr. Ortega.

365. As to the Quon ‘108 Patent, to reduce redundancy I incorporate by reference my

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

analysis in the “Non-Analogous Art” section as if set forth here in its entirety.

366. There is no teaching or suggestion in the Quon ‘108 Patent that its cooling system for cooling structures inside a semiconductor housing would be useful to a macro-scale immersion cooling of electronic appliances. This is in line with the common sense of a POSITA, who would not consider structures and processes for cooling inside a semiconductor packaging to be useful in designing a liquid single-phase immersion cooling system for electronic appliances. Although the need for improved cooling of electronics would have been generally known by a POSITA, the Quon ‘108 Patent only cools components inside the housing of a semiconductor housing, and so a POSITA would not be motivated to consider such a chip cooler. Finally, a POSITA design incentive would include avoiding the complexities of working at chip-level scale and working at a more manageable macro-scale, which would disincentivize a POSITA from considering the Quon ‘108 Patent chip cooling system.

367. It is my opinion that there is no motivation for a POSITA to use the Quon ‘108 Patent in combination with any other reference cited by Dr. Ortega.

368. As to the Rolfson ‘298 Patent, to reduce redundancy I incorporate by reference my analysis in the “Non-Analogous Art” section as if set forth here in its entirety.

369. There is no teaching or suggestion in the Rolfson ‘298 Patent that its film baking structures and processes would be useful to a macro-scale immersion cooling of electronic appliances. This is in line with the common sense of a POSITA, who would not consider structures and processes for baking a photolithography mask to be useful in designing a liquid single-phase immersion cooling system for electronic appliances. Indeed, Rolfson ‘298 does not even disclose or suggest the use of any dielectric fluid, as it has nothing to do with keeping an immersed electronic device cool. Although the need for improved cooling of electronics would have been generally known by a POSITA, the Rolfson ‘298 Patent, has nothing to do with cooling electronic appliances, and so a POSITA would not be motivated to consider such a film baker. Finally, a POSITA design incentive would include avoiding destroying the electronics by using a fluid that is not dielectric, which would disincentivize a POSITA from considering the

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

Rolfson '298 film baking system that does not use dielectric.

370. It is my opinion that there is no motivation for a POSITA to use the Rolfson '298 Patent, in combination with any other reference cited by Dr. Ortega.

P. Secondary Consideration

371. It is my opinion that Dr. Alfonzo Ortega failed to fully consider secondary considerations commonly recognized by the Federal Circuit as objective indicia of no obviousness. The result of Dr. Ortega's failure to analyze nearly any objective indicia of no obviousness renders Dr. Ortega's analysis deficient. I understand that a proper Section 103 no obviousness analysis requires examination of the secondary considerations. Thus, an analysis of relevant secondary considerations is set out below.

372. First, it is my opinion that Midas' products the Midas Crypto System, the Midas 50U System, and the Midas XCI system practice the asserted claims of the '457 Patent. I have come to this conclusion based upon my discussion with Midas employees Mario Conti and Jim Koen. I further base my conclusion on the information attached to this report as Exhibit 4, which is a claim-by-claim analysis of the current Midas products, the Midas Crypto Tank, and the Midas XCI tank. After my thorough review of the products, the claims of the '457 Patent, and my discussions with Midas personnel Mario Conti and Jim Koen, I adopt the analysis in Exhibit 4 as my own.

Q. Commercial Success

373. In this case, there is significant evidence of Midas' commercial success in selling the patented invention described in the '457 Patent. For example, I understand that in December 2021 Midas sold patented inventions for a total sales price of \$3,851,130 or \$385,113 per 2.5 MW unit (25 MW divided by 2.5MW per unit is 10 units or a capacity of 25 MW to Edge Data Solutions, Inc.²⁵ Midas additionally sold its cooling system for a capacity of 15 MW to Galaxy Qualified Opportunity Zone Business in March 2022 for a total sales price of \$3,928,980 or \$654,830 per 2.5 MW unit.²⁶ Further, Midas sold patented systems to Riot in 2021 and 2023,

²⁵ MIDAS0343199-221

²⁶ MIDAS0343320-24

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

each for 200 MW capacity.²⁷ The total value of these two contracts was \$27,849,200 and \$52,016,320 respectively. I am informed that Midas is the largest deployer of immersion cooling systems in the world.²⁸ Midas is responsible for roughly fifty percent of the currently deployed immersion cooling technology²⁹.

374. I understand that in order for the secondary consideration of commercial success to be weighed in favor of no obviousness, there must be some commercial nexus between the claimed invention and that commercial success. The commercial nexus of the patented claims and the commercial success must not be considered separately, but as a whole, considering the unique combination of the claims.

375. I understand that a patentee is entitled to a presumption of a nexus of the patented invention to the commercial success of the product where the patentee can show that the commercial success is tied to a specific product that embodies a patent, as long as the patentee can show that the invention is disclosed or claimed by that patent.

376. As I opined above, Midas' products practice the '457 Patent as claimed. It is my opinion that there is a nexus between the Midas '457 Patent and the commercial success of the Midas MCI products. The Midas MCI products are the embodiment of the '457 Patent and have been met with significant demand in the marketplace. Therefore, it is my opinion that Midas is entitled to a rebuttable presumption of a commercial nexus between the '457 Patent and the commercial success.

377. As I opined above, the claims of the '457 Patent were not embodied by any prior art reference as claimed. Therefore, the claimed invention of the '457 Patent presents a novel invention. This novel invention is what led to the significant market demand evidenced by large purchases from multiple parties.

378. To the extent any of the individual claims of the '457 Patent is found to be

²⁷ MIDAS0412076; MIDAS0343175-94; MIDAS0343195; MIDAS0343222-58; MIDAS0409102-19; MIDAS0409122; MIDAS0411591-602; MIDAS0411603-08; MIDAS0411628-35; MIDAS0411621-26; MIDAS0411627; MIDAS0411636; MIDAS0411637; MIDAS0411639; MIDAS0411638; MIDAS0411609-14; MIDAS0411615-20.

²⁸ Deposition of Scott Sickmiller at 143:21-144:6.

²⁹ *Id.*

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

embodied by a prior art reference, it is my opinion that it is the ‘457 Patent’s unique combination of those claims creates a nexus to the commercial success.

R. Copying by Others

379. Mr. Ortega opined that “MGT presents no evidence that its competitors have actually copied MGT’s claimed invention, as opposed to simply identifying that a mere similarity exists.” However, this is contrary to the facts of this case. For example, based on the Analysis of Himanshu Pokharna, as well as my discussions with various Midas personnel, I understand that the following companies have products that copy the ‘457 Patented invention: Green Revolution Cooling, Submer, BixBit, Engineering Fluids, Intelliflex, TMG Core, and Artic Systems LLC.³⁰

380. GRC spent five years redesigning their IceRaq S10 and HashRaQ Max.³¹ The final design of both products resulted in an infringing product.³² As stated by Mr. Poulin, the designated 30(b)(6) deponent for the Green Revolution cooling, “Any immersion-cooling system requires the cold fluid to be delivered to the bottom of the tank and the warm fluid to be -- recovered off the top of the tank. Otherwise, the system does not work.”³³ This aptly describes the impetus for the redesign of the GRC tank. The system as previously designed originally injected cold fluid into the top of the tank. As a result of the faulty design, GRC’s original system did not work. As a result, GRC redesigned the tank with a plenum on the bottom of the tank, thereby infringing on Midas’ patent.

381. Further, TMGcore had a single-phase immersion product which had the weir, or overflow lip, on the short wall of the tank. TMGcore single phase immersion product originally had a weir on the short wall. This product has since been redesigned by TMGcore. This product now has a weir on the long wall.³⁴

³⁰ Infringing Substitutes found in Exhibits 4a-4h in of the Expert Witness Report of Himanshu Pokharna.

³¹ Deposition of Peter Poulin at 48:25-49:10.

³² Infringing Substitutes found in Exhibits 4a-4b of the Expert Witness Report of Himanshu Pokharna.

³³ Deposition of Peter Poulin at 105:7-17.

³⁴ Infringing Substitutes found in Exhibits 4g of the Expert Witness Report of Himanshu Pokharna.

*CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER****S. Failure of Others***

382. There is evidence of the failures of others in the industry to gain a foothold. For example, GRC, Midas' initial top competitor, was forced to exit the crypto currency market between 2018-2023.³⁵ This decision was made by the board of directors, and was in response to a lack of demand for the GRC GEN 1 Tank in the crypto currency mining space.³⁶ Further, other companies have not been able to acquire large contracts to supply immersion cooling systems. For example, TMGcore has not been able to have success in the single-phase immersion cooling market.³⁷ Further, GRC has had limited commercial success selling their products. Since introducing the IceRaq Series 10, GRC has only been able to sell roughly \$5 Million dollars' worth of equipment, otherwise system does not work.³⁸

383. I also understand that there are several non-acceptable substitutes in the market. These have been determined to not be acceptable by the market due to lack of demand.³⁹ For example, Green Revolution Cooling Generation 1, also known as Carnojet or IceRaq S10, was not met with market demand. Further, other companies have failed to gain a market foothold. These companies include Icetope, DCX, DUG, Canaan, and Fijitsu. There is nearly no available evidence of customer demand for any of the immersion cooling products for the companies listed. Finally, a competitor TMGcore had a product which originally placed the weir on the short wall. This product was originally designed to have a dual pump system, because it had the weir on the short wall. The dual pumps were required to properly circulate fluid through the system, to ensure that no hot spots developed in the tank. The dual pump system increased energy costs. These increased energy costs decreased product demand. This led to the 2023 redesign of the product to place the weir on the long wall. Based on the foregoing, it is clear that the failure of others is an objective indicia of no obviousness which weighs in favor of a finding of no obviousness.

³⁵ Poulin at 57:3-57:20.

³⁶ Poulin at 55:22-57:20.

³⁷ Deposition of Scott Sickmiller at 135:5-12.

³⁸ Deposition of Peter Poulin at 233:7-19.

³⁹ Expert Witness Report of Himanshu Pokharna at Paragraph 151.

*CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER****T. Teaching Away***

384. There is evidence of teaching away. The inventor of the GRC GEN 1 tank, Christian Best testified that he would not have designed the GRC GEN 1 tank with a Plenum at the bottom of the tank because it could increase the risk of the fluid leaking from the tank.⁴⁰ This is directly contradictory to the Midas patented invention described in the ‘457 Patent. Christiaan Best’s design decision to not have a plenum at the bottom of the tank resulted in the plenum being at the top of the tank. The top plenum required positive pressure to inject cold fluid into the tank. Mr. Best testified the tank was designed to create a “standing wave”. If a “standing wave” had been truly employed by Mr. Best in the GRC GEN 1 System there would be no flow of cool liquid through the servers because the definition of a standing wave, also known as a stationary wave, is: “a wave that oscillates in time but whose peak amplitude profile does not move in space.” The result of a deployment of a standing wave within the GRC GEN 1 tank would eliminate movement of fluid through the servers, resulting in significant hot spots and rendering the design unworkable as a cooling solution for computer equipment.

XIV. ANALYSIS OF CLAIM 5 UNDER 35 U.S.C. § 102 AND 103.

385. I have determined that claim 1 of the ‘457 Patent is valid. As a legal consequence, I have been informed that claim 5, which depends from independent claim 1, is also necessarily valid. As a consequence, I undertake no additional analysis to conclude that it is my opinion that claim 5 is valid.

XV. RESERVATION OF RIGHTS

386. This Report serves as a reservation of rights to amend or supplement the opinions expressed herein. I reserve the authority to modify or enhance the content of this opinion, as circumstances may require, or new information becomes available. This reservation encompasses the right to clarify, adjust, or update any statements, conclusions, or recommendations contained in the original opinion, in order to ensure accuracy and relevance in light of changing conditions or additional data. I retain the prerogative to exercise this reservation at my discretion, with the

⁴⁰ Best at 122:23-124:1.

CONFIDENTIAL –PURSUANT TO PROTECTIVE ORDER

understanding that such amendments or supplements will be made in good faith and with the primary objective of maintaining the integrity and currency of the expressed opinions.

DATED: January 26, 2024

By:  0E566EE936DF4FF...

Dr. James Lee